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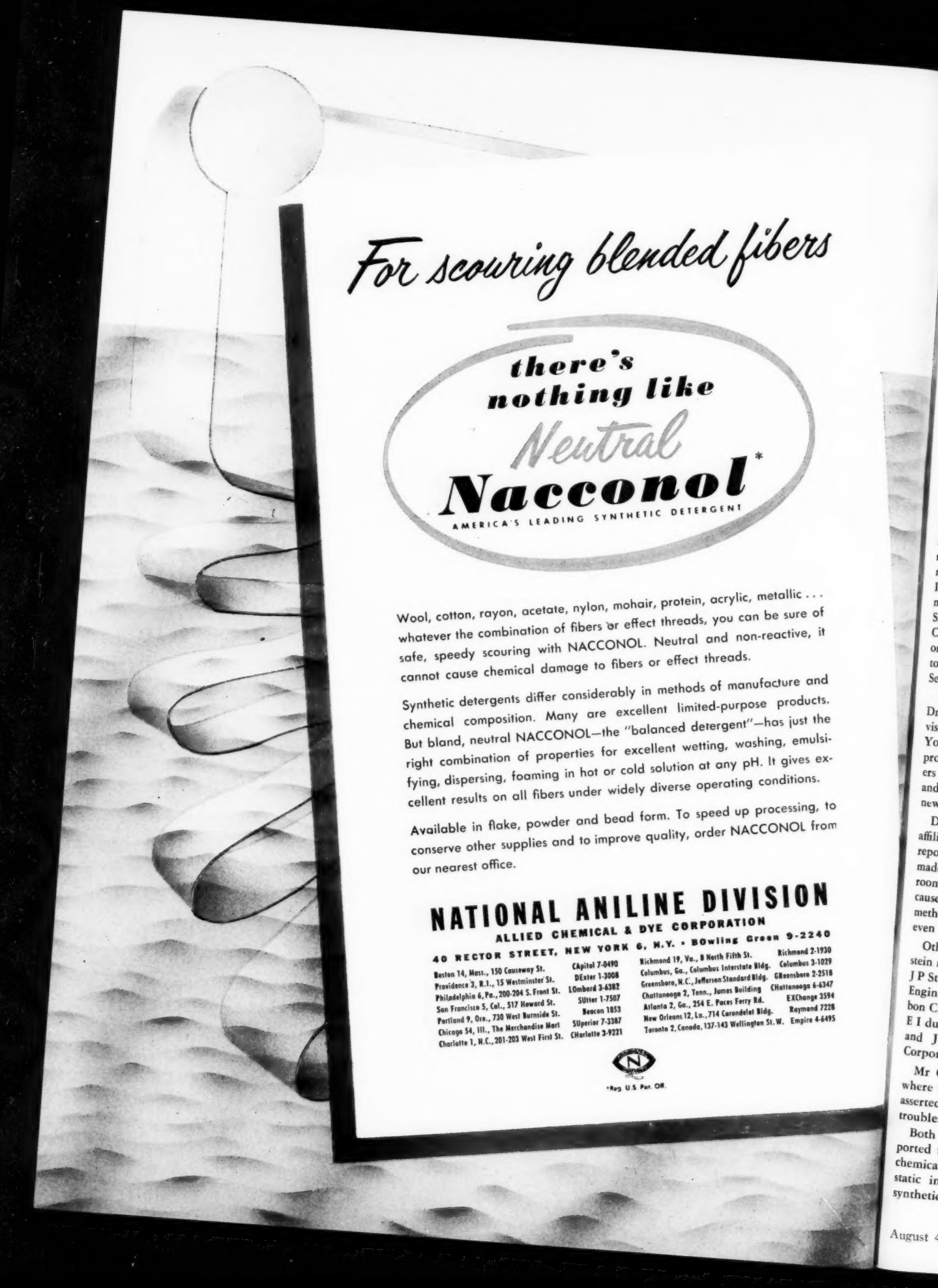

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Proceedings of the
American Association of Textile Chemists and Colorists

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Editor of Proceedings: Carl Z Draves, 30 Lahey St, New Hyde Park, N Y

August 4, 1952

Advisory Committee on Static Set for Fall Meeting

A SEVEN-MAN Advisory Committee on Static Electricity, in full agreement that the problem of static in the newer synthetic fibers must be met quickly and efficiently, is preparing for the first formal meeting this fall.

Formed under the auspices of the New York Section to "recommend fields of research related to static electricity for study by the AATCC as well as for a paper on static to be presented in the society's annual intersectional competition", the group met informally at a luncheon on June 25. Immediately after the session, committee members were requested by Chairman Sidney M Edelstein, Dexter Chemical Corp, to submit suggestions "as to methods or points of attack on the static problem" to be used as material for discussion at the September meeting.

Mr Edelstein, appointed chairman by Dr E W K Schwarz, chairman of the advisory research committee of the New York Section, outlined briefly some of the problems confronting textile manufacturers and consumers as the result of static and then introduced each member of the newly-formed committee.

Dr O I Bloom, hospital administrator affiliated with the Union Health Center, reported that, at the present time the man-made fibers are barred from operating rooms due to the danger of explosions caused by static sparks. He outlined the methods taken to insure against explosions even when natural fibers are worn or used.

Other members, in addition to Mr Edelstein and Dr Bloom, include J B Goldberg, J P Stevens Company; Robin Beach, Beach Engineers, Inc; S C King, Carbide and Carbon Chemical Company; Dr S W Brainard, E I du Pont de Nemours & Company, Inc and J J McGuinness, Dexter Chemical Corporation, *Secretary*.

Mr Goldberg, discussing static in mills where the newer fibers are being handled, asserted that the charges are so great that troubles and slowdowns occur regularly.

Both Dr Brainard and Mr King reported that their companies were seeking chemical means to meet the problem of static in the processing and use of the synthetic fibers. Both were in agreement that it was necessary to find a finish which not only would eliminate or minimize static but enable the user to wash or dry clean garments without removing the antistatic finish.

The group also discussed the lack of instrumentation which is holding back research into the problem and the unreliability of the method of testing for static with present equipment.

CALENDAR

COUNCIL
September 12 (Philadelphia); November 6 (Boston)

GENERAL RESEARCH COMMITTEE
(See Council dates)

NATIONAL CONVENTIONS
November 6-8, 1952 (Hotel Statler, Boston); September 17-19, 1953 (Hotel Conrad Hilton, Chicago); 1954 (Atlanta, Ga).

MID-WEST SECTION
October 4 (Hotel Bismarck, Chicago).

NEW YORK SECTION
September 26, October 24, November 21 (Kohler's Swiss Chalet, Rochelle Park, N J); January 30, February 27 (Hotel Statler, New York, N Y); April 17, May 22 (Swiss Chalet)

NORTHERN NEW ENGLAND SECTION
December 6 (Annual Meeting, Lowell Textile Institute).

PHILADELPHIA SECTION
Sept 12, Oct 24 (Penn Sheraton Hotel); Dec 5, Jan 16 (Kugler's Restaurant).

PIEDMONT SECTION
Sept 13 (Hotel Charlotte, Charlotte, N C).

RHODE ISLAND SECTION
Oct 24 (Providence Engineering Society); December 5 (Annual Meeting, Sheraton-Biltmore, Providence, R I).

SOUTH CENTRAL SECTION
Aug 22-23 (Outing, Chattanooga Golf & Country Club); December 6 (Patten Hotel).

SOUTHEASTERN SECTION
Sept 13 (Biltmore Hotel, Atlanta).

WESTERN NEW ENGLAND SECTION
Oct 3, Nov 14 and Dec 12 (Rapp's Restaurant, Shelton, Conn).

OTHER EVENTS

AMERICAN CHEMICAL SOCIETY

7th National Chemical Exposition, Sept 9-13, Chicago Coliseum, Chicago, Ill. This will include the 2nd International Art Exhibit.

AMERICAN SOCIETY FOR TESTING MATERIALS

1953 Annual Meeting, June 29-July 3, Chalfonte-Haddon Hall, Atlantic City, N J.

AMERICAN STANDARDS ASSOCIATION

3rd National Standardization Conference, Sept 8-10, Museum of Science and Industry, Chicago, Ill.

34th Annual Meeting, November 19, Waldorf-Astoria, New York, N Y.

AMERICAN TEXTILE MACHINERY ASSOCIATION

Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall, Atlantic City, N J.

CANADIAN TEXTILE SEMINAR

September 11-13, Queen's University, Kingston, Ont.

FIBER SOCIETY

Sept 10-11 (Princeton, N J).

INTERNATIONAL COTTON AND RAYON EXHIBITION

Sept 27-Oct 12, Busto Arsizio, Italy.

LEIPZIG FAIR

September 7-17, Leipzig, Germany.

NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS

41st Knitting Arts Exhibition, April 27-May 1, 1953, Atlantic City Auditorium, Atlantic City, N J.

NEW YORK BOARD OF TRADE (DCAT)

26th Annual Meeting: September 25-28, Pocono Manor Inn, Pocono Manor, Pa.

27th Annual Drug, Chemical and Allied Trades Dinner, March 5 (1953), Waldorf-Astoria, New York, N Y.

TEXTILE RESEARCH INSTITUTE

23rd Annual Meeting, Nov. 17-18, Hotel Commodore, New York, N. Y.

W VON BERGEN TO BE AWARDED 1952 OLNEY MEDAL

WERNER VON BERGEN, Director of Research and Control Laboratories of the Forstmann Woolen Company, Passaic, New Jersey, is the 1952 winner of the Olney Medal, it has been announced by the award committee. The formal presentation of the medal will be made at the annual meeting of the Association in Boston in November. Mr von Bergen will be the ninth person to receive the award, previous recipients being:

1944—Dr Louis A Olney
1945—Dr Milton Harris
1946—William H Cady
1947—Edward R Schwarz
1948—Harold M Chase
1949—Charles A Seibert
1950—Dr George L Royer
1951—Raymond W Jacoby

Mr von Bergen was born in Oberwil-Bueren, Switzerland, in 1897. He grew up in Bern, Switzerland, where he attended Public and High School. He obtained his diploma as chemist from the Technical College in Burgdorf, Switzerland, in 1916.

In 1917 Mr von Bergen worked as a chemist in The Textile Printing Mills, Suhr, Switzerland; in 1918 as a chemist in the Governmental Gas Laboratory, Zurich; from 1919 to 1926 as a chemist at the woolen mill of Pfenninger & Co, Waedenswil, Switzerland, with the exception of one year, 1922-1923, when he worked as a dyestuff technician at the I G Farbwerke of Bayer & Co, Leverkusen, Germany. In 1926 he joined the Forstmann Woolen Co.

He is co-author of the "American Wool Handbook" and the "Textile Fiber Atlas"; author of the wool and specialty hair chapters of Matthew's "Textile Fibers," 6th edition; and has over fifty publications in the field of fiber technology to his credit.

He taught woolen manufacturing at Columbia University for ten years. He was scientific consultant in the European Theater of War for the United States Army and is at present a member of the Advisory Board on Quartermaster Research and Development of the National Research Council as well as a member of the United States Department of Agriculture Wool Advisory Committee. He is also a member of the General Research Committee of the American Association of Textile Chemists and Colorists; Chairman of D-13, Subcommittee A-3 on Wool and Its Products of the American Society for Testing Materials; a member of the Advisory Committee of the Textile Research Institute; and Fellow of The Textile Institute.

Werner von Bergen

His hobbies are photography and mountain climbing. He married Marie Diggelmann in 1923 in Switzerland. He has three children, Fritz von Bergen, a chemical engineer with Westvaco Chemical Division, Mrs Gerald Crossman of Providence, Rhode Island, and Werner von Bergen, Jr, and one granddaughter.

Working at a time when there was little cooperative effort, little basic knowledge to build on, and generally poor support, Werner von Bergen had the vision to study all phases of wool fiber technology. He was a leader in adding to the fundamental knowledge available.

Working closely and sympathetically with the operating personnel in the mill where he is employed, teaching courses at Columbia University, and through his publications, particularly the Wool Handbook, he made a great contribution in spreading fundamental knowledge of the wool fiber into the industry as a whole.

Through laying out pioneer courses at Columbia University and in the classes organized in Passaic, Werner von Bergen has been enthusiastic in increasing the educational facilities on textile subjects.

Werner von Bergen has been an unselfish supporter of every group research activity which touched on his field, including constant support through the entire history of the United States Institute for Textile Research, through support of all studies endorsed by the Textile Committee of the ASTM, and through active participation in such progressive studies as the Wiegerink Drying Research and the present Wool Research Project which is being carried on in cooperation with the Textile Research Institute.

The most significant part of Werner von Bergen's contribution is the fact that he had the faith to carry on the work before research was fashionable and when support was so difficult to obtain that he had to carry on much of his cooperative effort on his own time, and attend meetings in which he made major contributions at his own expense.

Much of his earlier textile work was published in *Melliand Textilberichte.* More recently he has had many articles published in *American Dyestuff Reporter* and in *Rayon & Synthetic Textiles.*

* * *

The Olney Medal was endowed by the Howes Publishing Company, Inc, and is awarded by the Association at intervals of not less than a year for outstanding achievement in the field of textile chemistry, including the development of chemical agents or chemical processes used in the manufacture of textiles, or methods for their evaluation. Its purposes are to encourage and to afford public recognition of such achievements and contributions, and to be a testimonial to Dr Louis A Olney, Founder of the AATCC, for his lifetime of devotion and multitudinous contributions to this field.

The election of a candidate to receive the award is by unanimous agreement of the Olney Medal Committee of five, constituted as follows: (1) the President of the Association, (2) a member of the faculty of an educational institution awarding degrees in chemistry, (3) an employee of a concern manufacturing chemical products used in textile wet processing, (4) an employee of a concern manufacturing textiles, and (5) a member at large who may be any qualified individual. All must be senior members of the Association. The present members of the Committee are as follows:

(1) President C Norris Rabold, ex-officio
(2) Henry A Rutherford
(3) Raymond W Jacoby
(4) Harold W Leitch
(5) William D Appel

The Secretary of the Association is secretary of the Committee without vote. As the term of each member expires, the Committee itself selects a successor to serve for 4 years. Dr Harley Y Jennings has just been elected to the Committee to succeed Harold W Leitch whose term expired with the selection of this year's Medalist. William D Appel will serve as Chairman of the Committee.

Southeastern Section—

THE DYEING OF DYNEL AND RELATED PRODUCTS*

T A FEILD, JR

Textile Fibers Dept, Carbide and Carbon Chemicals Co
A Division of Union Carbide and Carbon Corp

INTRODUCTION

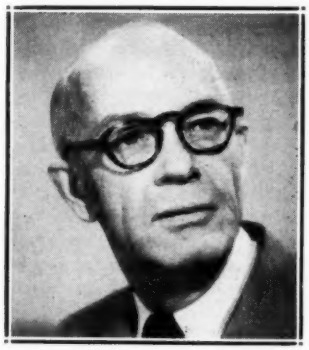
DYNEL and the new acrylic fibers constitute important new basic raw materials for the textile industry. As such they offer you and the industry a fresh challenge to utilize their unique properties for product improvement and resultant profit. Needless to say, much of the long-term success of these fibers depends on their ability to be colored by simple means.

When a new synthetic fiber is made available to the industry, a great deal, but certainly not all, is known about this fiber by the manufacturer. It is also true that neither the manufacturer nor the specialists working in various fields have a monopoly on ideas on how these new materials can be used and processed. I stress these points particularly with respect to dyeing and finishing, first, to put you on the alert and, second, to assure you that there is always a better way.

In the limited time that we have available this afternoon it will not be possible to deal at great length with all of the acrylic fibers. I would therefore like to begin this discussion with dynel, with which I am closely associated, and later discuss some of the others. For those who may not be familiar with dynel I would like to give a brief description of the product. Dynel is a new lost-cost synthetic fiber produced in staple form by Carbide and Carbon Chemicals Company, a division of Union Carbide and Carbon Corporation. It is made from a resin having 60% vinyl chloride and 40% acrylonitrile in the copolymer. The fiber has an unusual array of interesting properties, among which are great chemical resistance, including resistance to both acids and alkalis, resistance to fire, rapid drying qualities and ready dyeability. Uses for the fiber are being found in almost every field and include such diverse uses as wigs for dolls, paint-roller covers, blankets, men's socks and blends with other fibers for many apparel fabrics.

As the producer of dynel, Carbide and Carbon has made it a policy to make available to the textile industry new developments in dyeing and finishing and improved processing techniques as soon as they can be proven of value. While our objectives are to provide procedures that are simple and economical, we make every effort not to compromise with quality. In the dyeing of dynel the dyer has considerable latitude in his choice of dyes and procedures to meet his specific requirements. Since all end products do not have to meet the same fastness requirements, the good judgement of the dyer must be relied upon in this choice.

Few people not closely associated with the industry can appreciate the complexities of the problem faced by the research worker in developing methods for dyeing new fibers. The worker seldom realizes at the start what he is really facing. Once he succeeds in coloring the fiber his work as just begun, for then he must be sure that the color will meet all fastness requirements and can be applied in commercial equipment at low costs. These later phases require all the ingenuity, patience and persistance that can be mustered. The task is never completed. The successful commercial application of dyes to a new fiber is no accident. It is indicative, however, that the knowledge of dyeing has progressed to the point of being completely practical and economically feasible.



T A Feild, Jr

A pioneer in the dyeing of acrylic fibers discusses the present status of this branch of textile processing with special emphasis on the dyeing of dynel, a copolymer of acrylonitrile and vinyl chloride. He points out how the same principles of dyeing are applicable to other acrylic fibers.

Although basic, acetate and vat dyes are applicable to acrylic fibers at dyeing temperatures of 250°F in pressure equipment, dynel is being dyed mostly on a commercial scale in conventional equipment at a temperature of about 205°F with acetate dyes, acid dyes, or a mixture of the two. Acetate dyes have sufficient affinity for dynel to give full shades with only a little dispersing agent in the bath to disperse the acetate dye. The affinity of acid dyes for dynel at 205°F may be increased for medium shades with dispersed p-phenylphenol and for heavy shades with both p-phenylphenol and cuprous ions developed in the bath from copper sulfate and a reducing agent, either zinc formaldehydesulfoxylate or hydroxylammonium sulfate. For mixtures of acetate and acid dyes the author is authority for the recommendation of the omission of a swelling agent and the controlled addition of copper in cuprous form during dyeing.

The practical aspects of dyeing dynel in various forms are especially emphasized, as is also the need to avoid difficulties arising from the thermoplastic nature of dynel, which comes into question at wet-processing temperatures above 180°F. Directions are given to avoid the tendency of dynel to lose luster in a hot bath and to kink or wrinkle if cooled quickly during wet-processing.

DYEING DYNEL

Before discussing some of the newer developments in the dyeing of dynel, I would like to point out that the fiber is being dyed commercially with many of the acetate and acid dyes. In selecting dyes for dyeing dynel we are not forced to favor one class over another unless particular benefits are derived from that class. Methods for applying these colors have been described in published articles and in detail in our manual on dyeing. Briefly, there are three basic requirements for the practical commercial dyeing of dynel. These are *first*, use of dyeing temperatures of about 205°F or above, *second*,

* Presented before the Southeastern Section in Talladega, Alabama, on February 23, 1952.

maintenance of the luster of the fiber, and, *third,* consideration for the fact that the fiber is thermoplastic.

DYEING WITH ACETATE DYES ———Much of our dyeing in the past has been done with acetate colors, and an increasingly large volume of our dyeing today continues to be done with this type. We stress these dyes because of the simplicity with which they can be applied and their generally good fastness properties. In the earlier work on dynel use of the acetate dyes was limited to a considerable degree because we could not find light-fast blue dyes. Most of the yellows were excellent and the reds good. More recently several very good violets and blues have been made available by the dye manufacturers to complete the range of acetate dyes for dynel. In the application of acetate dyes to dynel few precautions are necessary other than to disperse the dye with minimum amounts of dispersing agent and to conduct the dyeing at temperatures of 205°F or above. Since dynel will blush in boiling water or at the dyeing temperature of 205°F, steps must be taken to avoid this condition. Addition of sodium sulfate to the dyebath midway in the dyeing has been found to do an excellent job of minimizing blushing (loss of luster).

The use of high concentrations of sodium sulfate in a dyebath or in boiling water to prevent blushing is an interesting development and is an important factor in the success of many of our dyeings. The action of salt on a blushed or water-delustered fiber, we believe, is one of osmosis whereby entrapped water is drawn from the hot fiber or, in certain cases, is prevented from entering the fiber.

DYEING WITH ACID DYES——— In the application of acid and direct dyes to dynel three procedures have been used successfully. In the first method, used almost exclusively for pastel shades, the dye is applied from an acid bath at a boil without the aid of dyeing assistants. In this method the natural affinity of the fiber for the dye is used, and the prime requirement is that the material be thoroughly wet out before dyeing is started.

In the second method, used for medium shades, low amounts of copper sulfate with zinc formaldehydesulfoxylate to reduce the copper are added first to the dyebath at room temperature. After the dye is added, the temperature is raised and dyeing is carried out at a boil for 60 minutes. The bath pH is usually adjusted to a value of 5. In this procedure, the cuprous ion increases the dye affinity.

In the third method, used for heavy shades, a swelling agent, which is usually p-phenylphenol in amounts up to 2.25% is added at the start of dyeing either in the micronized form, or as the soluble sodium salt, which is subsequently neutralized. Prior to the addition of copper sulfate and its reducing agent the bath pH is adjusted with sulfuric acid to a value of 6. The dyes are then added, and dyeing is carried out at a boil for 60 to 90 minutes or until the correct shade is obtained. In this procedure the swelling agent is employed to permit more dye sites to be reached by the cuprous copper and thereby obtain greater depth of color.

In each of these methods blushing during dyeing is prevented by the use of sodium sulfate, or the fiber may be relustered after dyeing with strong salt solutions or with dry heat.

CUPROUS-ION METHOD ——— The development of the cuprous-ion dyeing techniques for acrylic fibers resulted from much work and keen observation on the part of several workers in our laboratories. As theories regarding the mechanism of the process have been published, I do not intend to deal with explanations here.

The practical use of the process and some of the things that happen may be of interest. For those of you who may not be familiar with the cuprous-ion dyeing methods I would like to say that the process is primarily one in which acrylic fibers normally having low affinity for dyes under ordinary conditions are given a high affinity for many acid and direct cotton colors simply by introducing copper in the cuprous form into the acid dyebath. Cuprous copper is specific to acrylonitrile-base fibers and is believed to form a bond between certain nitrile groups in the fiber and dyestuff molecules. Those fibers with the highest acrylonitrile content therefore have the highest receptivity for dyes fixed with cuprous copper. Acrylic fibers dyed by the cuprous-ion method are characterized by unusually good fastness to washing.

The two methods employing cuprous copper that were originally described have been used with considerable success, but they have also caused troubles, which, we believe, have now been overcome. In studies in the laboratory it has been learned that many things can and do take place in dyeing with cuprous copper. For example, during the course of a dyeing, the cuprous copper, which is introduced in a soluble, almost colorless form, may become a finely divided yellow, red or brown oxide powder, or it may even revert to elemental copper. In addition, depending on the acid used in dyeing and the wetting agents employed, one or the other or all of these forms may exist during the dyeing. It has further been found that the highest bath temperature is most favorable to the fixation of the dyestuffs, and, in this temperature range, the formation of the insoluble copper oxides and other unavailable copper complexes is also greatest. The formation of insoluble matter, should it occur in a dyebath, will present a problem from a crocking or filtration point of view. If unavailable copper complexes or cupric compounds are formed, the effectiveness of the copper used will also be reduced. Conditions that permit changes of this type are therefore highly undesirable when predictable results must be obtained. In the procedures which are now recommended sulfuric acid is always used in preference to other acids to avoid these general conditions.

CONTROLLED ADDITION OF COPPER———Recently we announced what we called "The Controlled-Addition-of-Copper Technique" for dyeing dynel and other acrylic fibers. In this process, which is being used extensively now, we simply mix cold solutions of copper sulfate and its reducing agent and then add the mixture at a controlled rate to the boiling dyebath. In this way we introduce the soluble, active, reduced copper to the dyebath at its point of maximum effectiveness at a rate which may be chosen to obtain the desired rate of color exhaustion and buildup. By the use of this technique we appear to have made another important advance in the dyeing of dynel and other acrylic fibers. First, the amount of reduced copper used is usually less than formerly required. This is true because the copper introduced is largely consumed in the dyeing process and does not accumulate in the dyebath either as simple excesses of copper salts, which are usually undesirable, or as unavailable copper complexes. Second, color values are usually increased with a resultant lowering of dye costs. Third, the process lends itself to exceptionally nice control.

MIXTURES OF ACETATE AND ACID DYES———Our practice of dyeing dynel with mixtures of acetate and acid dyes has caused many in the industry to raise their eyebrows. This is definitely a case where we have violated the rules to accomplish an end. A word of explanation is therefore in order. The acetate yellow dyes have outstanding light fastness on dynel and are superior to the acid yellows. The acid blue dyes on the other hand, when dyed by the cuprous-ion technique, usually build up better and have better light fastness than the acetate blues. It was only natural, therefore, to try to combine these types. As might be

expected, at first we had a great deal of trouble, but, as a result of this trouble, progress was made. The "Controlled Addition of Copper" technique for applying acid dyes was developed as a result of this trouble. The method permits the practical use of mixtures of acetate and acid dyes in the dyeing of dynel. In the use of such mixtures the fiber is dyed at the boil with the two types of color, usually without a swelling agent. After 20 minutes the dyebath pH is adjusted to a value of 6, and a cold mixture of copper sulfate and zinc formaldehydesulfoxylate is dripped into the boiling bath to exhaust the acid dye. Further additions of either acetate or acid dye may be made to correct for shade since excesses of copper have been avoided.

SELECTION OF DYES AND METHODS——We have now briefly described three important methods for dyeing dynel. The natural question, then, is which method is best, or, when should we use one or the other methods. The answer, of course, is that the dyer must choose the method and the dyes that best meet his requirements, keeping in mind these general considerations:

First—Acetate dyes have excellent leveling qualities, very good wash fastness and, with proper selections, especially of the blue component, excellent light fastness.

Second—Acid dyes applied by the "Controlled Addition of Copper" technique have outstanding wash fastness and light fastness commensurate with the dyes selected. Usually less dyestuff is required for heavy shades than with acetate dyes. Pastel shades are simple to obtain and do not require dye assistants.

Third—Mixtures of acid and acetate dyes applied by the "Controlled Addition of Copper" technique are of particular importance where very heavy shades with excellent wash and light fastness are required.

Fourth — Light-fastness measurements made on the Fade-Ometer are generally much more severe than those made in natural sunlight. The differences in fastness to the two sources of light are not constant but vary with the dyestuff. Usually, Fade-Ometer exposures are browned, while natural sunlight bleaches the color.

COMMERCIAL METHODS OF DYEING——Thus far we have dealt in a general way with methods for dyeing dynel. I am sure there are some here who are much more interested in practical dyeing. I would therefore like to say something about dyeing the fiber on a commercial scale. While it will be impossible to discuss all the different methods, I will cover briefly bulk dyeing of staple, package dyeing, and hosiery dyeing. Each of the methods of dyeing described for the application of acetate and acid dyes are applicable in these processes.

STOCK DYEING —— Most dyers usually consider bulk dyeing of fibers in closed machines the simplest and probably least troublesome of all the different means of dyeing. In the case of dynel we made the same assumptions and then learned the hard way. Improperly done it can be a source of much grief.

In stock dyeing, the basic principle is to circulate the dye liquor by means of a pump through a cake of the fiber at the proper dyeing temperature and thereby to exhaust the dye. In our small-scale laboratory dyeing machines the stock dyeing of dynel appeared to offer no problems at all. When the scale of operations was stepped up to 50 and 500 pounds of 3-denier staple, real trouble began to show up. The dyeings were extremely uneven; they were dirty; in some cases cake shifting with liquor by-passing was found, while in others the cake was simply packed as hard as a rock in the bottom of the machine. It would be difficult to find more trouble than I have described.

In solving these problems we built a glass machine in order that we might see what actually went on. It was soon discovered that finishes on the fiber and other materials added as surface-active agents foamed to such an extent that air pockets in the fiber mass persisted throughout dyeing. As the temperature of the dyebath increased, pressure due to the flow of liquor caused the fiber mass to be compressed into a tight cake. This condition considerably exaggerated the effect of foaming. The foam or air pocket present thus finally blocked the flow of liquor completely. In the glass machine we also learned that once a dynel cake is tightly compacted due to the flow of liquor, if the pumping pressure is stopped while the liquor is at the dyeing temperature the cake will expand some 20 or 30 per cent in volume. If the dye liquor is cooled with the pressure on the cake, it does not expand and a tight hard cake results.

Using the information obtained in these studies we now obtain excellent dyeings. To overcome the effects of foaming we use the minimum amount of agents that cause foam, and then we add a small amount of a suitable antifoaming agent, such as Depuma or D C Antifoam Emulsion A at the time of loading. We load at 150°F because lower operating pressures result. To end up with a soft cake we simply turn off the pump at the end of dyeing and drain the machine of hot liquor. We refill for rinsing with cold water to set the expanded cake.

When the dyeing of staple is undertaken in equipment such as an open vat, which does not operate under pressure, the loading technique is the same as for pressure equipment. Since the fiber cake is not being compressed by the high rates of liquor flow, greatest loft and openness of fiber is achieved in these dyeings by slowly cooling the dye bath at the end of dyeing.

PACKAGE DYEING —— Most dyeing of dynel in yarn form is being done today in packages. Possibly it is fortunate for us that package dyeing is not generally considered easy, and that those in the business have had enough experience with the older fibers to realize that departures from standard practice may easily result in trouble. Package dyeing begins with the winding operation, and here it is important to emphasize three points with dynel: First, a very soft package, softer than is customary for cotton, must be wound. This may be on Franklin springs or on rigid tubes. Second, if friction-type winders are used, care must be taken to be sure that units are in proper alignment or the yarn may be cut on the shoulders from abrasion. Third, it is very good practice to crimp package shoulders to insure maximum levelness. Since soft cakes are easily shifted in handling, they should be handled with particular care when placed on the spindles.

When proper cakes are made and loaded, probably the most important requirements for good package dyeing of dynel have been met. There are, however, several other points that are important to the success of the operation, and these have to do with the thermoplastic nature of the fiber. Since dynel is thermoplastic and at the dyeing temperature of 205-210°F it can be made to assume almost any shape, it is essential that, while the dyebath is at these elevated temperatures, the pump must not be stopped lest the packages shift and allow liquor to by-pass. When it is desired to sample, or to stop the pump for other reasons, the bath should be cooled slowly to temperatures in the range of 175-180°F. The same practice should be followed at the end of dyeing. In addition, liquor circulation at the end of dyeing should be entirely from inside to outside to produce packages that wind well and are free from crimped places. The use of sodium sulfate either in the dyebath when this is permissible or as a separate operation to obtain relustering is essential in package dyeing.

HOSIERY DYEING —— Men's hosiery is an item that interests most of us because we are the consumers. Most dynel hosiery today is being piece-dyed with acetate-type dyes because it is usually best not to use copper when elastic is present

in the dyebath. In actual practice dynel hose are being dyed loose and in open-mesh nets, usually made of cotton or of Orlon acrylic fiber. Both paddle and rotary-type closed machines are used.

The dyeing operation is carried out as follows:

1) The dyes are dispersed in warm water and added to the machine partly filled with hot water and further dispersed.

2) Water is then run into the machine to bring it up to its operating level.

3) The goods are added dry.

4) The temperature is raised to 205-210°F, and dyeing is carried out for 30 minutes, at which time 60 to 80% sodium sulfate owf is added.

5) Dyeing is continued for 60 minutes or until the correct shade is obtained.

Possibly the most important single step in hosiery dyeing is the proper cooling of the hot dyebath at the end of dyeing. To obtain finished socks free from wrinkles, a condition often referred to as "crow's feet," it is essential that the socks be permitted to float freely during dyeing and as they are cooled to 120°F.

After dyeing we seldom scour light shades, but with dark shades a good scour with soap or an anionic detergent, such as Tergitol 7, is employed. Where exceptional wash fastness is required with these colors, we may even give a second scour at 160°F with sodium hydrosulfite and soda ash. An antistatic finish, usually Amide PES, is applied after scouring or rinsing.

Boarding of the socks is usually done, after they have been air dried, on internally heated forms at a steam pressure of 5 or 6 pounds. Continuous boarding machines operating at 215°F are likewise being used successfully in some mills.

OTHER ACRYLIC FIBERS

ORLON———We have confined our discussion up to this point largely to dynel, but the remarks about the cuprous-ion method of dyeing and the controlled-addition-of-copper technique as applied to acid dyes are generally applicable to other acrylic fibers. "Orlon" is the trade-mark for the DuPont Company's acrylic fiber, another member of this new and growing family of fibers. Its composition is almost wholly polyacrylonitrile. Like dynel it has many interesting and valuable properties to recommend its use.

In the dyeing of Orlon two methods are currently being employed. The first, which is useful for basic, acetate and vat dyes, employs pressure equipment and dyeing temperatures of 250°F. The second method, which is probably much more widely used, employs the cuprous-ion dyeing technique at dyeing temperatures of 205-212°F. In the most recent recommendations of the DuPont Company regarding the cuprous-ion method, hydroxylammonium sulfate is used as the reducing agent for the copper sulfate. In practice heavy shades require 10 per cent copper sulfate with 4 per cent of the reducing agent, while light shades require 2.5 per cent of the copper salt with 1.0 per cent reducing agent, both owf. At the start of dyeing the copper sulfate is added and circulated and then the hydroxylammonium sulfate, which has been neutralized with caustic soda to a pH of 5-6, is added. The dyes are next added and the temperature is raised to 205°F for dyeing. Dyeing is carried out for 60 to 90 minutes. Corrections for shade are made by lowering the bath temperature to 190°F to make additions and then by dyeing for 30 minutes more at 205°F. The procedure has been used successfully for the dyeing of raw stock, top, yarns and piece goods. Orlon Type 81 filament yarns are likewise being dyed by the cuprous-ion method with the addition of a swelling agent, such as p-phenylphenol.

The general fastness properties of Orlon dyeings resulting from the cuprous-ion procedure are very good with sunlight light fastness ranging from 4 to 6 for 3 per cent dyeings with selected colors. Wash fastness is also very good even for full dyeings when they are properly scoured subsequent to the dyeing operation.

ACRILAN ——— The newest member of the acrylic-fiber family to be introduced is known as Acrilan made by the Chemstrand Corporation, which is constructing a new plant at Decatur, Alabama, for its manufacture. While the composition of Acrilan has not been made known, it is believed to be a copolymer, with acrylonitrile as the predominant monomer.

The dyeing of Acrilan with acid-type dyes at low bath pH values in the presence of nitric acid with good results has been reported by Woodruff (1). Actual recommendations on the best procedures for dyeing Acrilan have not been made public. In our laboratory we have had very good success in applying acid colors to Acrilan acrylic fiber by the controlled addition of copper as employed for dynel.

In concluding this discussion I would like to emphasize that the dyeing of dynel and some of the other acrylic fibers has reached the stage where dyeing is commercially practical. We and many of the dye manufacturers stand ready to help you. I would also like to emphasize that newer and lower-cost methods will certainly follow in the dyeing of these fibers, as there is always a better way.

REFERENCE

(1) J A Woodruff, *Am Dyestuff Reptr* 40, P402 (1951)

Report of Student Award Committee for 1952

THE committee for the AATCC student award is pleased to announce the names of the nine students who were honored this year by being presented with the American Association of Textile Chemists and Colorists Award at their respective schools.

Norman Burton Weinstein, Bradford Durfee Technical Institute

Coy J Gray, Clemson College

Robert S Zecker, Fairleigh Dickinson College

Lindsay P Dixon, Georgia Institute of Technology

Haig C Donoian, Lowell Textile Institute

Robert A Pearson, New Bedford Textile Institute

Arturo Martin de Nicolas, North Carolina State College

Warren S Clapp, Philadelphia Textile Institute

Herbert M Kagi, Utica Technical Institute

The award book this year was "An Introduction to Textile Finishing" by J T Marsh, considered by the committee to be a most practical and useful addition to any young textile chemist's library because of its treatment of the subject of finishing, about which there is too little on record.

In addition to this book award each selected student receives a year's membership in the Association.

The members of the Student Award Committee, speaking for the entire Association, congratulate each of these students for the exceptional work he has done at his school during his college career.

Respectfully submitted,
H C Chapin
Percival Theel
T R Smith
George H Wood
P J Wood
JOSEPH LINDSAY, JR, *Chairman*

Midwest Section——

DYEING OF MATERIALS FOR PLAIN AND FACE-FINISHED AUTO FABRICS*

M G MORRIS

National Aniline Div of Allied Chemical and Dye Corp

A specialized branch of textile processing, the dyeing and finishing of automobile upholstery fabrics, is described. The dyeing and finishing of these materials are largely carried out by mills equipped for handling men's wear. Better qualities of auto fabrics now usually contain at least 70% wool, the balance being mostly nylon and/or rayon. They are most often face-finished, that is, given a severe fulling and a face napping, which completely obliterate the original weave. Dyeings must therefore be sufficiently fast to withstand such finishing. The author explains what classes of dyes are used, mostly for stock dyeing, and how uniformity and levelness are attained. A most important problem discussed by the author is the avoidance of the effects of lime from pulled wool or hard water on quality of dyeing.

INTRODUCTION

ORIGINALLY, the closed car was upholstered almost exclusively with pile fabrics. However, because of costs and other factors, pile fabrics have been quite largely displaced by all-wool or part-wool smooth fabrics, either plain or face-finished. The patterns used for decorations are somewhat similar to those in use on men's wear or topcoat cloths. Probably that is only natural because those mills that had been the most experienced manufacturers of men's wear were best adapted and equipped for the manufacture of auto fabrics.

FACE FINISHING

The term "face-finish" is used because the cloth is subjected to a very severe finishing routine only on the face. Originally it was reserved for all-wool cloths, but of recent years has been largely used on part-wool materials. In the latter case there must be a wool content of close to 70%, while 30% of substitute fibers is often made up of nylon and rayon. The severity of the finishing operation requires that only those dyes having best fastness to finishing are permissible, while the car builders permit the use of only those dyes having best fastness to light. You will get a better idea of what is required of a dyestuff in the face-finishing operation if we review the routine briefly.

After being woven, the cloth is inspected to remove knots. It is then tacked face in so there will be no scuffing or abrasion of the face in fulling. The cloth is then fulled for 5 to 6 hours, perhaps longer, with a fulling soap consisting of 7 to 9 ounces of soap, 3 to 5 ounces of soda ash, 1 ounce sodium hexametaphosphate and 1 ounce of Nacconol NR per gallon of water. It is shrunk in width from more than 80 inches to less than 55 inches and fulled so solidly that the weave usually disappears entirely. It is then scoured at 110° F with the soap still left after fulling. If that soap is not active enough to produce good suds and scouring action, it should either be corrected or strengthened until it does.

After the goods are scoured in rope form, the tacking is removed, the cloth is opened to full width and extracted. It is then given sufficient running over teasel gigs and wet brushes to raise a long fuzzy nap. This nap is laid in one direction only, but it is not yet permanently set in that position. The first setting operation to which it is subjected is potting, an operation that is very severe on dyes. In potting, the cloth is rolled onto a hollow perforated cylinder, 2 or 3 pieces in a roll. It is then wrapped many times with a heavy canvas and immersed into a tank containing water at a temperature between 160 and 200° F, depending upon what temperature the color will stand. This hot water is then pumped through the cloth roll for ½ hour from inside-out, then ½ hour outside-in, and dumped. This hot wet treatment on the tightly wrapped roll softens the fibers and presses the straight, one-way, fuzzy nap down flat. While it is firmly held in this position, fresh cold water is pumped thru the roll for ½ hour. This subsequent chilling of the preset fibers sets them permanently in that position. This whole operation is called "potting" and is the required operation in face finishing.

The cloth is then extracted, dried, sheared, pressed and decated. In decating, one layer of cloth and one layer of heavy canvas, about 200 yards, are wrapped together around a perforated hollow cylinder and placed in a pressure chamber. Here, steam at about 15 pounds pressure is pumped through the roll for 15 minutes from outside-in and for 15 minutes from inside-out. Fresh cold air is then sucked through the roll until it is cold. Here again we have another heat-setting operation, followed by a chilling operation to fix the fibers permanently in the position in which they were placed by gigging and wet-brushing. That completes the face-finishing operation. In it the chief color-destroying operations are fulling, scouring, potting and decating. Their combined effect is to produce a material so different in texture and color from what it was in the beginning that it is hardly recognizable as the same piece. It adds a pile, a luster and a solid firm feel to woolen cloth that cannot presently be obtained in any other way.

DYEING

To introduce pattern work into the fabric, raw-stock dyeing is usually resorted to, but even in solid color work raw-stock dyeing is generally used because it permits the production of a large yardage of excellent uniformity. This is a very important point stressed by car builders because it reduces their cutting costs and reduces the possibility of installing pieces from two different dye lots in the same car.

* Presented before the Midwest Section at the Bismarck Hotel in Chicago on February 16, 1952.

The wool, rayon or nylon that most mills use are all stock-dyed separately, with wool representing the largest proportion. A small amount of rayon included in the blend adds much to the luster and lowers the cost. A small amount of nylon, for example, 10% to 15%, adds tremendously to the strength and abrasion resistance, in some cases doubling the abrasion resistance, depending on the type of nylon used. Staple produces much more strength than wastes.

Some woolen mills have tended to shy away from the manufacture of auto fabrics, feeling, rightly or wrongly, that the profit margin was too narrow. In any case, whether that is true or not, successful operation on auto fabrics requires a large yardage, a small number of colors and a limited number of fabrics in the plant. Two to four fabrics at one time is usually enough, especially if there are many colors in them. It also requires continuous operation, preferably on a 3-shift basis, no rehandling and as few batch processes as possible. For the dye department this rules out stripping, redyeing or similar preparatory or extra treatments that add nothing of value to the product. Car builders require strict adherence to schedule with large lots of good uniformity week in and week out. They have no facilities to store overshipments from one week and cannot stop their lines to await deliveries in other weeks.

That being the case, the dye department must produce matches with one eye on the clock and the calendar and the other on the work. About 70% of the work will be on wool and the balance distributed over rayon and/or nylon. In dyeing wool some plants dye wools, noils or garnets separately. Others dye them all together, with or without blending before dyeing. Pressure kettles are preferred and 500- or 1000-pound sizes are very suitable. Both will take overloads up to 20% on practically any blend of wool, and they should be overloaded for cheapest operation.

When wool is loaded into the dye kettle dry, it is well wet out with hot circulating water containing Nacconol NR. The bath is then set at 120° F, and the dyestuff, Glauber's salt and acid are added carefully. The pumps are then operated until even distribution of dye solution is obtained. The temperature is then raised to the boil in 45 minutes, and boiling is continued ½ hour. Acid is then added to exhaust the color, and the bath is boiled ½ hour again. Chrome is then added and boiling is continued for ¾ hour longer. The material is finally rinsed cold and dried.

After a formula has been established, two or more kettles may be dyed with the same formula on the same stock at the same time. These wools are then blended on the squeeze-roll extractor and again in the wool dryer, to produce an extra large lot of one color. A sample of the blended lot is taken for color later. If corrections are required, they are added to subsequent lots, which will be blended in turn with the first lot so as to build up to any desired quantity. In this way lots of several thousands of pounds each are assembled without the expense and loss of time required for additions in the dye kettles.

Top-chrome dyeing can be speeded up and a production increase of 30 to 40% obtained by changing the method of loading. Instead of loading dry stock in the usual way, wetting out, then carefully adding the dyeing ingredients, a faster method is available, for either wet or dry stock. For this method, load in all the ingredients first at 130° F: ½% Nacconol NR, 2½% ammonia, 4% acetic acid, 56%, 5% anhydrous sodium sulfate and the dyestuff. Then load the dry wool as fast as convenient. At 130° F in the presence of Nacconol NR and ammonia, the wool wets instantly, distributing the color perfectly as loading proceeds. When the stock is all in, fasten down the covers, raise the temperature to the boil in 15 minutes and boil ½ hour. Add acid to exhaust the color and boil ½ hour longer. Then add chrome, boil ¾ hour longer, rinse and dry. This method produces results fully equal to those obtained by any other top-chrome method, with a very worthwhile saving in time and an increase in production. It also lessens the chances for errors and carelessness.

While wool is being dyed and assembled, cut-staple or waste nylon is likewise being dyed to shade to combine with it. Waste nylon is cheaper than staple, it is in fairly good supply and is suitable for the purpose. It is dyed with either chrome, Chromolan or milling colors in accordance with the shade and fastness required. Chrome types are difficult to chrome over to their true shade and the chrome is quite difficult to remove from the nylon. Consequently, under certain conditions, subsequent finishing operations can change the shade of some chrome colors. Milling colors have the advantage of exhausting easily from a slightly acid bath but lack the fastness to boiling water of fully chromed chrome types. Chromolan dyes have been found to be very good even in heavy shades. However, in the case of nylon it is advisable to check a sample dyeing before putting a sample into work, to see that it has sufficient merit to warrant a trial. Wherever the fastness to boiling of milling or Chromolan colors is passable they are preferred over chrome types. For best evenness of shade, either should be loaded into the dye liquor containing Nacconol NR, dyestuff and Glauber's salt. Whatever acid is required should be added later, preferably in two portions.

Rayon staples in sizes of 1½, 3, and 5 deniers have all been used in auto fabrics. Three- and 5-denier types are more suitable from the standpoint of level dyeing than the 1½-denier size, which is not so satisfactory in that respect. For best evenness of shade, whether with staple fibers or the wastes so popular today, the rayon should be loaded directly into the sulfur-color bath made up with soft water, sodium sulfide, dyestuff and soap at 140° F. The temperature is raised promptly to 190° F. One-half the Glauber's salt is then added, and the bath is run ½ hour at 190° F. The second half of the Glauber's salt is then added and running is continued for another ½ hour. The bath is then dropped, the stock is rinsed several times until clear and is aftertreated in a fresh bath with 5% acetic acid, 56%, and 3% chrome at 160° F for ½ hour. The stock is then rinsed and dried.

The aftertreatment is very important, as it practically eliminates the danger of fire from spontaneous combustion in the dryer. Rayon dryers are equipped with low-temperature sprinkler heads to meet this hazard, which in some mills has attained a frequency of one fire a week. However, in more than 25 years I have not yet seen a dryer fire on sulfur-dyed rayon or cotton that has been aftertreated.

After sufficient wool, nylon and rayon are assembled, each on shade, to make a production lot of, say, 10,000 pounds or more, a mix ticket is given the blending department. This ticket shows what proportions of what lots of wool, nylon and rayon are to be used, and they are immediately blended in that proportion and sent to the card room. The cloth is subsequently made and face-finished and should be near enough to shade to be acceptable. Usually with three or more colors in a pattern, slight differences are not too objectionable but will be corrected on subsequent lots. In solid colors, however, even very slight divergencies from standard give the appearance of being far off shade. In such cases corrections in the piece may have to be resorted to. They are done at low temperatures, 120° F, so as not to disturb the face finish. This is carried out in the dye kettle or dolly washer with neutral-dyeing acid or Solantine colors of best fastness to light, with the addition of ½% soda ash and 5% Glauber's salt. Additions may be made at fifteen-minute intervals, if necessary. Amazingly

small quantities of dyestuff, such as 5 to 100 grains per 1000 lb of cloth, give surprising changes in the final shade and permit corrections which at first glance might be considered hopeless.

Since these materials are not made up with the intention of correcting the shade in the piece, the stock blend and spinning oils are not selected for piece dyeing. Consequently, stock-dyed pieces usually would not be in condition for dyeing by the ordinary piece-dye routine. Such lines, therefore, may tend to produce streaks if large corrections are made. However, the quantity of dyestuffs customarily resorted to in such cases is generally small enough so that no trouble arises.

Cheaper fabrics, both stock- and piece-dyed, are offered to the trade without the face-finishing feature. Stock dyes of this type are usually fulled much more lightly than face-finished cloths, and the potting operation is eliminated. In this case no unusual finishing fastness is required and the ordinary woolen-mill stock-dye procedure is followed. Other cheaper lines are made up by combining cotton and wool yarns in the weaving to produce figured effects, such as diamonds, squares, plaids, etc. These are piece-dyed with fast-to-light union and neutral colors and finished to make the pattern stand out. These goods are fulled and scoured first, then piece-dyed, sheared, pressed and decated. The principal requirements here are uniformity of color from batch to batch and freedom from streaks and stains. I am convinced that there is very little that can be done in the dye-house alone to eliminate streaks and stains. The dyer must, of course, select types of dyes which are known to have the best level-dyeing qualities, and must apply them by accepted methods for level dyeing. He must also use all precautions in regard to addition of exhausting agents and conditions of raising the temperature to the boil. Most complaints of streaks and stains in piece dyeing, however, come even after the dyer has done all those things. Therefore, precautions to remove the cause must be made long before the cloth reaches the dyehouse. They should begin with the blending of the stock.

AVOIDING EFFECT OF LIME IN DYEING

For fool-proof results in piece dyeing, only fleece wools should be used. Pulled wools should be eliminated. However, if for some reason management cannot eliminate pulled wools, they can still be used very satisfactorily, provided account is taken of their presence in fulling and scouring. The formula for the fulling soap must be changed or fortified with sufficient sodium hexametaphosphate to regenerate any lime soap formed in fulling and scouring. Then, just to make certain that the goods are free from lime soap after scouring, additional sodium hexametaphosphate should be added to the first rinse bath. If a suds rises shortly after it is added, there is trouble ahead in piece dyeing unless the lime soap is all removed with as much more sodium hexametaphosphate as it takes to do it. In general, it can be said that it is practically impossible to guarantee level dyeing of any wool or part-wool fabrics if a test sample will raise a suds by shaking in a one-pint mason jar with sodium hexametaphosphate for a few minutes.

In the wool-pulling process a paste of lime and sodium sulfide is painted on the flesh side of the skin. Two skins are then hung flesh to flesh in full width over night in an air conditioned room at 45° F. The next day they are sent to the beam house where the wool is simply pulled off the skin. It is then sorted, collected and washed. In the painting of the lime-sulfide mixture, great care is taken by the pulleries to see that none gets onto the wool side and it usually does not. However, it is probably inevitable that at some points in the operation some paste from the operative's glove gets onto the wool, either in painting, hanging or pulling. It is from some such minor contamination that pulled wool does pick up the lime that is known to be on it and which gives rise to complaints against it for use in piece dyeing. When we consider that one part of calcium will precipitate 20 times its own weight of soap, it is seen that we do not need much lime to cause a great deal of trouble. One particularly bad case that came to our attention showed a concentration of 0.03% calcium on both warp and filling and produced horrible results with ordinary level-dyeing acid dyes. However, the same cloth dyed perfectly level with the same formula, after being treated with sodium hexametaphosphate during scouring.

After a careful selection of wools for piece dyeing has been made, an equally careful selection of spinning oils is necessary. Very fine spinning oils are available at low cost, consisting principally of inexpensive mineral oil and small proportions of sulfonated oils, mahogany soaps or similar emulsifiers. They are ideal for spinning from practically every angle but are not readily removed from wool by scouring. Consequently, they can produce stained and streaky piece dyes identical in appearance with the results produced by lime soaps, the actual cause for which can only be determined by analysis. Spinning oils for piece dyeing, therefore, should be carefully selected only from among those previously known to be readily emulsifiable. This ordinarily suggests animal or vegetable oils, such as lard or olive oils or a mixture of either of them with not more than 40% to 50% of mineral oil. However, both of those oils possess disadvantages in use or price. Newer and very readily emulsifiable synthetic and mineral oils are available, which are definitely known to produce satisfactory results.

After we have made certain that both our wool blends and our spinning oils are suitable for piece dyeing, we should give close attention to the process water. Tests should be made to see that it actually *is* soft and arrangements must be made to see that there is enough of it. By-passes whereby hard water could contaminate the soft water should be closed and locked. But, even with soft water, sodium hexametaphosphate should be used in scouring because soft water systems may not deliver fully softened water for long.

If these precautions are followed, one can be reasonably sure that piece goods can be dyed day in and day out, free from stains and streaks. This will hold true no matter what types of colors are used to dye them with.

NEW FIBERS

This discussion has been confined to wool, cotton, rayon and nylon as these are the fibers most widely used in auto fabrics today. It is safe to say, that, for the near future, auto fabrics will probably continue to be made from those fibers as at present. However, new fibers are appearing from time to time, each of which is receiving the attention of the car builders. These fibers include Acrilan, Dacron, dynel, Fiber E, Orlon, Saran, Vicara, etc. So far, none of them has appeared to have what it takes to displace the current fibers and fabrics. However, we can be sure that any fiber or fabric that presents a good appearance, possesses improvement features of any kind and is available at a fair price, not necessarily cheap, will have a good reception in the automotive field.

LAPEL BUTTONS FOR MEMBERS

These buttons bear the seal of the AATCC and may be purchased by members in good standing from the National Secretary at $2.00 each.

DR HAROLD C CHAPIN
Lowell Textile Institute
Lowell, Massachusetts

Rhode Island Section——

AN INVESTIGATION OF UREA-FORMALDEHYDE FIXATION ON VISCOSE RAYON*

R F NICKERSON

Textile Research Laboratory
Monsanto Chemical Company
Boston, Massachusetts

INTRODUCTION

IT is now about 25 years since Foulds, Marsh, and Wood (2) discovered that the wrinkle resistance of cellulosic fabrics is remarkably increased by thermosetting resins properly applied. The original process has been improved and greatly extended, so that its wide current use must certainly exceed the inventors' most optimistic hopes. Indeed it has been said with some justice that the growth in importance of viscose staple fiber could not have taken place without the resin process.

The treatment of textiles with synthetic resins is a series of superficially simple operations. Technically, however, the process is complex and has presented the further difficulty that only indirect methods of investigation are available. The technologist must depend largely on examination of the finished textile for his understanding of the process. The performance of the fabric finish is therefore of major importance to the finisher and to the technician as well as to the consumer.

This paper reports an investigation of urea-formaldehyde resin retention by all-spun-viscose-rayon fabrics. Resin retention is widely used, both as a measure of the quality of the finished goods and as a means of determining the influence of different process variables. In other words, resin retention is used for quality control in production and for product and process evaluation by the technician. The data presented here clearly reveal that resin retention by itself is so crude that it has very limited value for this purpose. Resin retention is the percentage of applied resin that remains on the fabric after a wash. Accordingly, it is a measure of the washfastness of the resin.

The question was: Is resin retention valid for quality control and product and process evaluation purposes? A thermosetting resin, such as urea-formaldehyde, is applied to viscose rayon to stabilize the fabric against wash shrinkage, or to make the fabric wrinkle-resistant, or to improve the handle or body of the fabric. Of course, a combination of these effects might be sought. These are the end results desired by the finisher and on which the ultimate consumer judges the goods.

R F Nickerson

A laboratory study of the washfastness of urea-formaldehyde resin on viscose rayon is reported. Washfastness of resin, often called "resin retention," or "fixation," is widely used for quality control and process evaluation work in resin finishing.

Resin retention determined by weight losses from acid stripping may vary sharply with the resin load applied and is not a precise measurement. The values obtained may not even indicate the washfastness of the resin reliably. Soluble fiber residues extracted by the stripping bath vitiate the result. Furthermore, a close correlation between resin retention and viscose-rayon shrinkage was not found.

Since urea-formaldehyde resin is applied to viscose rayon to produce certain desirable stabilization effects, the direct measurement of fabric properties is recommended for evaluation of U-F finishes.

PROBLEM FOR INVESTIGATION—— Is resin retention a measure of the presence of these performance properties? In other words, is there a direct correlation between resin retention and fabric properties? Such a correlation is assumed to exist where resin retention is used as a quality-control and process-evaluation method. There was reason to suppose that this assumption was not valid. First, no direct proof of this relationship was known to exist. And, secondly, previous work (3) had shown conclusively that substantial amounts of resin can be fixed in fabric without any alteration in fabric properties.

EXPERIMENTAL

The steps in the application of thermosetting resin are reviewed briefly in Table I.

TABLE I

Bath: U-F Precondensate and Latent Catalyst in Water.
Fabric: Viscose Rayon or Cotton

Operation	*Result*
1) Impregnate	Fibers swell*; U-F and catalyst enter.
2) Squeeze	Liquor between fibers removed.
3) Dry	Fibers lose moisture and shrink*.
4) Cure	Desired properties develop.
5) Wash	Residues extracted.

* Principally cross-sectional.

* Presented before the Rhode Island Section in Providence, R I, on Jan 26, 1952.

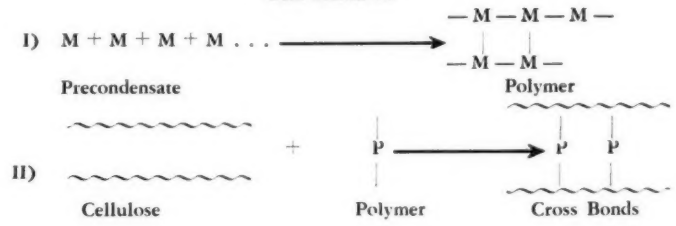
It is necessary to emphasize that, for the type of application represented, the methylol-urea or other precondensate must be water-soluble and small enough in molecular size to enter the fibers.

The heat treatment or cure operation is an extremely important step in the process. It is known with certainty that the desired fabric properties developed as a result of this operation. The mechanisms by which these changes are believed to come about are indicated below in equations I and II:

TABLE II
WEIGHT LOSS AND RESIN RETENTION

Set I		*Set II*	
Weight Loss—%		*Weight Loss—%*	
Cured	*Washed*	*Cured*	*Washed*
13.3	10.4	12.8	11.1
13.4	11.1	12.9	10.8
13.6	11.9	13.6	10.2
Retentions—%	*Maximum*	*Minimum*	*Average*
Set I	89.5	76.5	82.8
Set II	86.8	75.0	81.7

Cure Reactions



First, methylol urea reacts with itself to produce polymer; and, secondly, polymer reacts with cellulose and produces cross bonds. Such cross bonds would inhibit fiber swelling and reduce fiber plasticity. In terms of finished fabric, reduced fiber swelling and plasticity appear as stabilization and wrinkle resistance.

The experimental work required for a decision on the resin retention question naturally involved the making of many determinations. The most common procedure for determining resin retention is by the weight-loss method, which is outlined below. Details of the method are available (*1*).

Resin Retention
(Weight-Loss Method)

Samples:

A, cured only; B, cured and washed

1) Dry and weigh samples
2) Extract with dilute acid
3) Dry and reweigh

Weight Loss:

of A=Total Resin; of B=Fixed Resin

$$\% \text{ Retention} = \frac{\text{Fixed}}{\text{Total}} \times 100$$

It should be noted that both the unwashed and washed samples are extracted with aqueous solutions in this method.

An alternative method is as follows:

Resin Retention
(By Nitrogen Content)

Samples:

A, cured only; B, cured and washed

1) Dry and weigh samples
2) Determine nitrogen content (Kjeldahl)

$$\% \text{ Retention} = \frac{\text{Nitrogen of B}}{\text{Nitrogen of A}} \times 100$$

Since the urea resin contains nitrogen, resin retention can be approximated from the ratio of fixed to total nitrogen. In this case, no aqueous treatment of the unwashed sample is necessary. The importance of this difference between the two methods will be apparent later. Both weight-loss and nitrogen methods were used in this study. The data reported here are for urea-formaldehyde (U-F) resin and for all-spun viscose rayon. The application consisted of padding, drying and curing which were kept constant throughout the work. A standard AATCC cotton wash was used to remove nonfixed resin so that all the retentions obtained are on this basis.

One of the first series of experiments yielded the data plotted in Figure 1. Varying amounts of U-F were applied, cured, and tested in parallel. The graph clearly shows that resin retention by weight loss varies considerably with the amount of U-F applied. The magnitude of this variation was completely unexpected.

Almost at the outset it was evident that resin retention by weight loss is not a precise determination. The variability of results is illustrated by Table II, where the data from triplicate determinations on two similar treatments are presented.

It can be seen from Table II that resin retention estimates may differ appreciably depending upon the "washed" and "cured" values chosen to form the ratio. Certainly a resin retention based on single "washed" and "cured" values would not be particularly reliable. Further comparisons of this kind indicate that the average of duplicate determinations may differ by 5 percentage points from the true value.

A scatter diagram of all the weight-loss values for cured fabrics is presented in Figure 2. This graph has two major points of interest: First, the weight losses found after cure are directly proportional to the U-F solids applied; and, secondly, there is a definite loss in weight for fabric to which

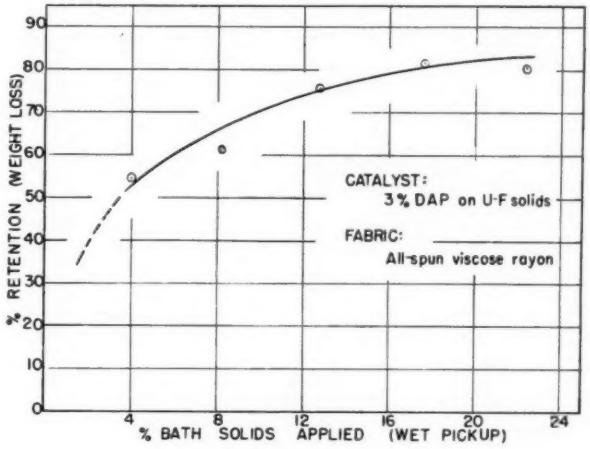


Figure 1

Wash Retention of U-F Resin on Viscose Rayon and Variation of Retention with Solids Add-on under Comparable Conditions of Application.

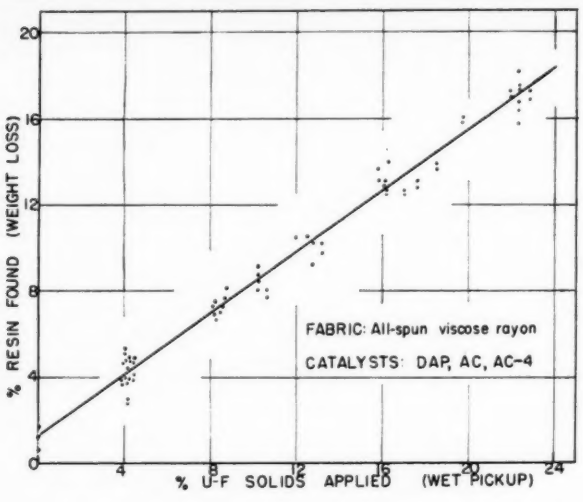


Figure 2

Relationship between Urea-formaldehyde Solids Add-on to Viscose Rayon and Resin Found Directly after Cure by Weight Loss Method.

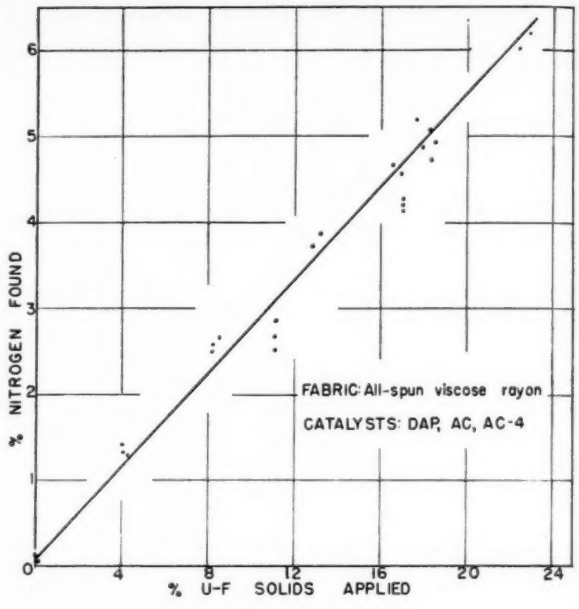


Figure 3

Relationship between Urea-formaldehyde Solids Add-on to Viscose Rayon and Nitrogen found directly after Cure.

no resin was applied.

A scatter diagram of the nitrogen contents of cured fabrics is shown in Figure 3. Again a direct proportionality exists between nitrogen found and resin applied. In this case, however, only a small residue of nitrogen is yielded by untreated fabric, and this residue is readily accounted for by the dye content of the goods.

Comparison of Figures 2 and 3 suggests that the aqueous extraction used in the weight-loss method is probably the cause of the difference observed in the behavior of untreated fabrics in the two methods. As might be expected, this difference has real significance, which the following work is intended to show. First, weight losses, both after "cure" and after a "wash," were determined for parallel treatments representing a range of solids applied. The data obtained are presented in Figure 4. Washing obviously reduces the weight-loss values over the whole range, but, more importantly still, an untreated sample undergoes no weight loss on acid extraction after being washed. Better-than-ordinary estimates of resin retention can be made from Figure 4 by formation of the ratios of values along the "cured and washed" line to the corresponding values along the "cured" line. Retentions so calculated are shown in Figure 6.

A similar analysis to that just described was made by the nitrogen method for parallel treatments of the same all-spun viscose rayon. The data from this series of experiments are plotted in Figure 5. Again, washing decreases the apparent resin content but appears to have little, if any, effect on the untreated fabric. Resin retentions have been calculated from the ratios of values along the "cured and washed" line to those along the "cured" line, and these also are shown in Figure 6. Incidentally, neither Figure 4 nor Figure 5 indicates any consistent difference in performance of the two catalysts employed.

The curves in Figure 6 show beyond any doubt that the two methods give decidedly different estimates of resin retention except at high resin "add-ons". It is emphasized that the resin-retention estimates represented by Figure 6 were obtained in the manner indicated in the outlines above. Accordingly, the estimates based on weight losses correspond to those generally obtained in practice by this method. An unassailable inference from Figure 6 is that both curves cannot possibly represent the true values of resin retention, particularly at the lower "add-ons". While neither curve may accurately represent the true retention values, there are reasons for supposing that the nitrogen curve is, in fact, nearer the truth. First, since the bulk of the nitrogen found must arise from resin, it follows that nitrogen is a direct measure of resin. Figure 3 also supports this conclusion. Secondly, all weight losses, on the other hand, are not necessarily resin, but retentions are calculated on the assumption that they are. Actually, the evidence presented indicates that, in addition to resin, some fiber substance is removed in the acid extraction of the "cured" samples. The influence of such extractable fiber substance would be proportionately greater for low add-ons than for high, which Figure 6 shows to be the case. Thirdly, it is apparent that good estimates of resin retention should be given by the ratio of the "washed" to "cured" slopes in Figures 4 and 5. Retentions so calculated are over 80% for both nitrogen and weight-loss methods over the whole range of solids applied. And, finally, retentions have been determined for bleached cotton at low U-F add-ons by both weight-loss and nitrogen methods. The two methods in this case agree and yield retentions of approximately 90%. Cotton, after being boiled off and bleached, would not be expected to contain any soluble matter that would influence the results obtained by either method. It is a reasonable conclusion, therefore, that "resin retentions" obtained by the weight-loss method on viscose rayon may be completely unreliable, especially at low resin add-ons.

The results of a detailed study of the U-F spun-viscose combination with three different cure catalysts are presented in Table III.

For each level of U-F solids applied, the applications and cures were made in parallel. This procedure was designed to keep processing conditions identical for the three catalysts. Duplicate determinations of resin retention by the weight-loss method were then made for each catalyst at each level of solids applied. The means of all determinations for each level of solids applied were then calculated, and the average deviation for each catalyst from the group mean was obtained. The data show that, within experimental error, there are no significant

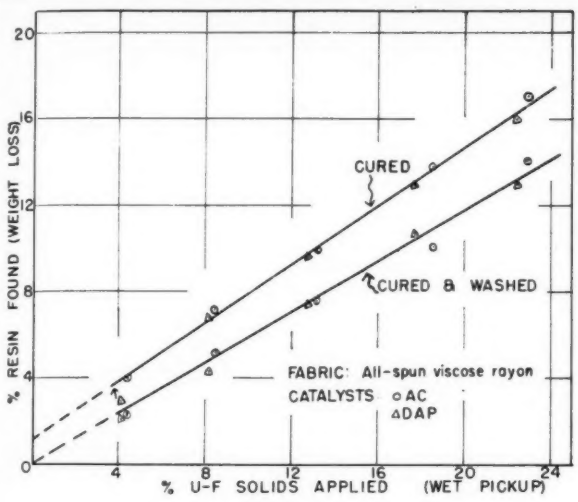


Figure 4

Effect of Washing on Weight Losses of Resin-treated Viscose Rayon over a Range of Applied U-F Solids.

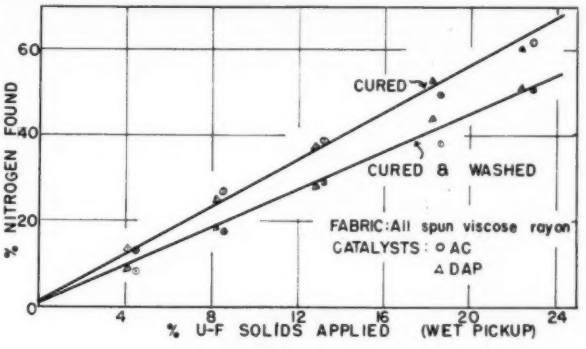


Figure 5

Effect of Washing on Nitrogen Content of Resin-treated Viscose Rayon over a Range of Applied U-F Solids.

differences in "resin retention" among the three catalysts. Inspection of Figures 4 and 5 gives further support to this conclusion.

A similar experiment was conducted in which relaxation and wash shrinkages rather than retentions were determined. All resin applications and shrinkage measurements at each level of solids applied were made in parallel. Relaxation shrinkage is that caused by immersing the loose fabrics in water and wetting agent for 30 minutes at 100°F, hydroextracting, and pressing them dry on a flat-bed press. Total shrinkage is relaxation plus the additional shrinkage of an AATCC cotton wash. The observed shrinkage data as area* shrinkages are presented graphically in Figure 7. Each experimental point shown is an average of 3 separate resin-application and washing treatments. The data for Catalyst AC-4 are almost identical with those for Catalyst AC, and hence are not included. The curves in Figure 7 clearly indicate that DAP is inferior to Catalyst AC in imparting shrinkage control through U-F resin. Similarly, DAP is inferior to Catalyst AC-4.

Parallel tests already mentioned show no differences in "resin retention' (by weight losses) as between catalysts. Further comparable and parallel tests show that shrinkage-control performance does differ among the same catalysts. Therefore, it must be concluded that a *1:1 correlation between "resin retention" and fabric performance does not exist.*

* Sum of % warp and % filling shrinkages.

DISCUSSION

The evidence presented indicates that "resin retentions" determined by the weight-loss method for U-F on viscose rayon may be both unreliable and misleading for routine testing work. The value of the determination is particularly low for establishing small but important differences in finished fabrics. Any comparisons of "resin retention" not made at identical U-F add-ons are likely to be meaningless. Under some conditions the "resin retention" value found by weight loss may not even be a close approximation of the actual washfastness of the resin. The major cause of difficulty in such cases is likely to be water-

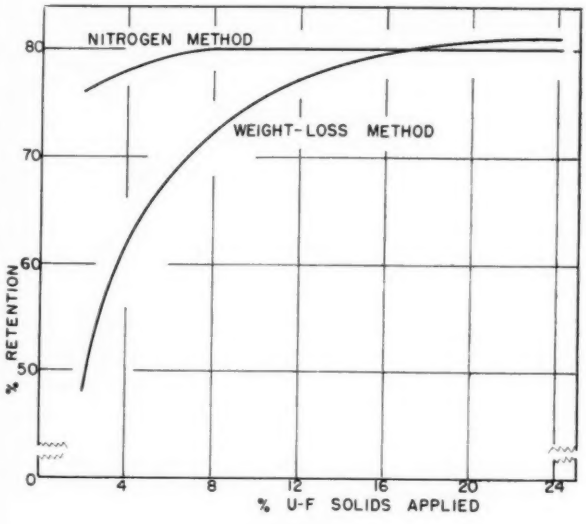


Figure 6

Resin Retentions Determined by Two Different Methods for Viscose Rayon over a Range of U-F Add-ons.

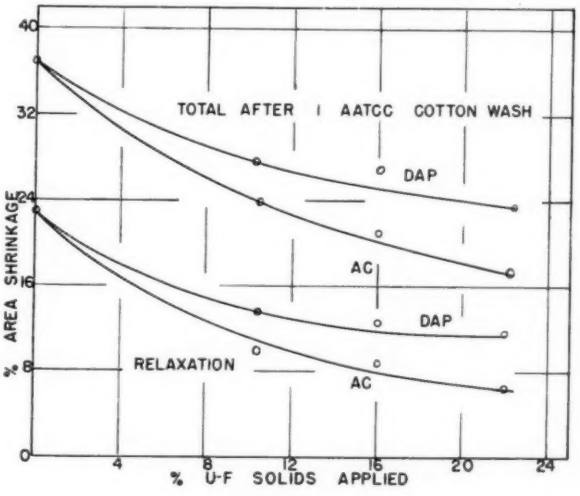


Figure 7

Variation of Area Shrinkages of Treated Viscose Rayon with U-F Solids Add-on.

TABLE III

RESIN RETENTIONS BY WEIGHT LOSS

(Parallel applications of U-F to all-spun viscose rayon)

% U-F Solids Applied	*% Resin Retention (Av)*	*Deviations from Average*		
		AC	*AC-4*	*DAP*
10.3	72.1	—1.9	+0.7	+1.1
16.1	77.7	—1.0	+2.2	—1.2
22.3	85.7	—0.6	—0.1	+0.7

Duplicate determinations in each case.

extractable fiber residues, which are not resin but are counted as such in the analysis. The probability is high that the quantities of extractable residues may not only vary from lot to lot of viscose rayon but also may decrease as the resin add-on is increased. For these reasons the use of a weight correction may not be feasible.

Where an approximation of washfastness of resin is wanted, an analysis for nitrogen before and after a wash may yield a fairly reliable result. Even then, corrections for the nitrogen content contributed by dyestuff and catalyst residues should probably be applied to the data.

The lack of a close correlation between washfastness of resin as measured either by weight-loss or nitrogen methods on the one hand and fabric shrinkage on the other hand may stem from the fact that U-F resin can be insolubilized in and on cellulosic fibers without appreciable changes in fabric performance properties (*4*). A reasonable explanation of this phenomenon is that the resin may be insolubilized through simple polymerization, while both polymerization and cross-bond formation are necessary for fabric stabilization effects.

Foulds, Marsh, and Wood (*2*) originally suggested that "the success of the treatment is to be judged by physical rather than chemical tests". This suggestion is worth remembering. For routine quality-control tests and for product and process evaluation work, the measurement of a stabilization effect, such as wash shrinkage, is suitable in most cases. Certainly, the direct determination of the degree to which a desired fabric property has been produced can be recommended.

It cannot be emphasized too strongly that the objections raised in this paper to "resin retention" concern the weight-loss method as used for urea-formaldehyde on viscose rayon. The extent to which these objections apply to other cellulosic fibers and other resins has yet to be determined.

ACKNOWLEDGMENT

Appreciation is extended to Mary A Goodwin, who did all of the application work reported in this paper, and to M A Oliver and her associates, who made the nitrogen determinations.

REFERENCES

1) Bernard, J J, *Am Dyestuff Reptr* 40, P837 (1951).

2) Foulds, R P, Marsh, J T and Wood, F C, USP 1,734,516, Nov 5, 1929.

3) Nickerson, R F, *Am Dyestuff Reptr* 39, P46 (1950).

4) Nickerson, R F, unpublished work.

South Central Section Set for Summer Outing

THE Chattanooga Golf & Country Club will be the site of the South Central Section's Annual Outing on August 22-23, which will feature golf, horseshoes, bridge canasta, etc. A full program has been planned for the ladies.

Joe T Bohannon, Jr (American Aniline Products, Inc) is Chairman of the 1952 Outing. He is assisted by H P Loveless, Jr (Crystal Springs Bleachery), *Sectional Chairman;* W K Newman (Peerless Woolen Mills), *Finance,* Mrs John O Sweitzer, *Ladies;* S C Hennessee (Dixie Mercerizing), *Golf;* R W Freeze (American Aniline Products, Inc), *Entertainment;* Ed Jurczak (Burkart-Schier), *Men's Sports;* Glenn R Bellamy (Ciba Co, Inc), *Prizes;* and William G Agnew (Dixie Mercerizing), *Registration.*

—♦ ♦—

Meeting Report— PSW Section

June 20, 1952

Rodger Young Auditorium, Los Angeles, Calif

THE Pacific Southwest Section held a technical meeting and dinner on Friday, June 20, 1952 at the Rodger Young Auditorium in Los Angeles, California.

Thirty-five members and their guests attended the dinner, at which N Kohler, section chairman, presided and introduced the new members present.

A H Roberts, secretary, read the minutes of the previous meeting, which were approved, and F Hazelhorst, treasurer, gave a financial report showing definite progress in the Section. R Mishell, outing committee chairman, discussed tentative plans for the annual outing to be held at Ojai, California, on October 4.

H W Zussman of Alrose Chemical Company gave an interesting and informative talk on "Organic Sequestering Agents and Their Textile Applications".

A symposium on textile processing was postponed until the next meeting.

Respectfully submitted,

ANGUS H ROBERTS, *Secretary*

LTI ALUMNI TO MEET AT CONVENTION

ALUMNI of the Lowell Textile Institute will gather during the 1952 Convention at a luncheon to be held on Saturday noon, November 8th at the Hotel Statler.

Among the guests who will extend the greetings of their respective institutions are the following:

Bradford Durfee Technical Institute—Leslie B Coombs, President

A French Textile School (Georgia Institute of Technology) — Herman A Dickert, Director

Institute of Textile Technology—Joseph F Vaughan, President

Lowell Textile Institute—Martin J Lydon, President, and G Nathan Reed, Dean of Faculty

Massachusetts Institute of Technology—James R Killian, Jr, President, and Edward R Schwarz, Professor in charge of the Textile Technology Division

New Bedford Textile Institute—George Walker, President

School of Textiles, North Carolina State College—Malcolm E Campbell, Dean

Philadelphia Textile Institute — Bertrand W Hayward, Director, and Richard S Cox, Dean

Rhode Island School of Design—Max W Sullivan, President, and W D Fales, Head of the Textile School

PERSONNEL SERVICE AT CONVENTION

FOR the purpose of introducing members to employers, Personnel Service will operate, without charge, from Thursday afternon, November 6th, through Saturday morning, November 8th at the 1952 Convention in the Hotel Statler, Boston. Members seeking employment should, if possible, register before the convention; but members, as well as employers, may register at the convention.

Every member expecting to use this Service in seeking employment is requested to write in advance to Dr H C Chapin, Secretary, AATCC, Box 28, Lowell, Mass, for two blanks on which to state his qualifications and desires. For attachment to these, two photographs measuring about 2 x 2½ inches are desirable.

Employers registering with the Service at the convention will be permitted to consult these records, and will be assisted in arranging interviews between 2 PM and 5 PM on Thursday, between 9 AM and noon and 1 PM to 5 PM on Friday, and between 9 AM and noon on Saturday. Representatives of educational institutions also are invited to register for the purpose of answering inquiries about their students.

27th Annual Outing, NNE Section

ONE-HUNDRED and eighty-seven members and guests turned out for the 27th Annual Outing of the Northern New England Section on June 6th at the Merrimack Valley Country Club, Methuen, Mass, and eighty-four went home with prizes (including the grand prize — a power lawnmower).

Chester M Kopatch, Ciba Co, headed an Outing Committee, which consisted of the following:

Chairman ex-officio—C Wendall Lever, Goodall-Sanford; *Golf*—Alfred T Grant, Pacific Mills, Henry X DeRedon, Ciba, John L Waldo, National Aniline, and Herbert E Wieland, American Woolen; *Softball*—Joseph E Travers, United Aniline; *Horseshoes*—Alfred J Carbone, Sandoz; *Prizes*—William W Pennock, Du Pont, and Frank W Benvie, General Dyestuff; *Dining*—Edward B Bell, Textile Aniline, John R Markgren, W C Durfee Co, John N Dalton, Pacific Mills, and M Phillips Graham, Calco Chemical; *Cards*—William A Stickney, Jr, United Aniline; *Music*—Robert Kay; *Program*—Azel W Mack, Dexter Chemical, and John F Sheehy, Pacific Mills.

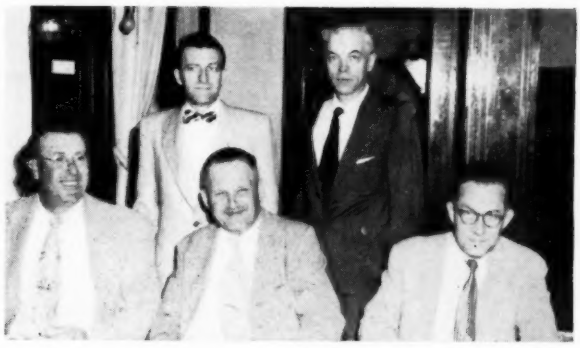
Low gross honors in the Class A (0 to 13) golf tournament went to Alfred T Grant, Pacific Mills Worsted Division. J F Kneeland, Arnold-Hoffman Co, was low net winner in the same class.

Winners in the guest division were G Wildman, low gross, and W Park, low net. S P Sweatt, Geigy Co, won the award for being nearest to the pin on the 16th hole, though R E Derby, Jr and J Kmon, Ware Knitters, were closer. E J Snyder had the longest drive with 229 yards. Mr Kmon won the putting contest with a 37.

Softball winners included J Murphy, G Neville, A Burke, E Belton, H Wood, L Gleklon, W Williams, A Johnson and J Travers.

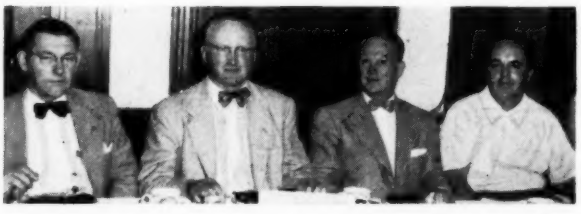
Winners of other events: *Horseshoes*—R Strickland, J MacDonald, H Shozel and H Walz; *Forty-fives*—J Burnett and C Brown; *Cribbage*—H Glidden and R Lyle.

(L to r): John Markgren (Durfee Co), Ed Bell (Textile Aniline), George Linberg (Synthron)



(L to r): Standing—Frank O'Niel, National Intersectional Contest Chairman; E Bell, Dining Committeeman
Seated—A T Grant, golf; Herb Weiland, golf; and John Markgren, dining

(L to r): Sylvester Sawyer (Goodall Sanford), W Senechal (Goodall Sanford), M Lane (Geigy), F Fleming (Goodall Sanford), Leo Monty



(L to r): C Wendall Lever (NNE Section Chairman), C M Kopatch (Outing Chairman), W Pennock (Prize Committee), H X deRedon (Golf)

(Photos, NNE Section Outing)

(L to r): John Sheehy (Pacific Mills) and Azel Mack (Dexter Chemical), Prize Committeemen; Joseph Travers (United Aniline), Softball Committeeman; George Linberg (Synthron), 1952 Convention Chairman

Outing Chairman Chester M Kopatch of Ciba (third from left) poses with three of his "Golf" Committeemen. (L to r): John L Waldo (National Aniline), Henry X deRedon (Ciba), Mr. Kopatch, and Alfred T Grant (Pacific Mills).

(L to r): Al Peel (Goodall Sanford), unidentified, Milton Johnson (Calco), Frank Murphy (Sandoz), Jim Morgan (Zinnser), Joe Collins (Atlas), Andy Woronka (New England Chemical & Supply)

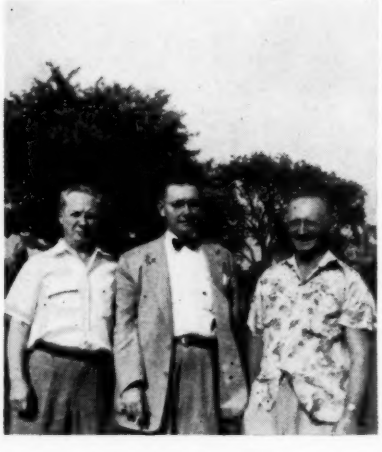
Sectional Chairman C Wendall Lever (Goodall-Sanford) presents Outing Chairman C M Kopatch (Ciba) with an electric clock in appreciation of his supervising the arrangements

Clubhouse, Merrimack Valley Country Club

George Malloy, winner of the grand prize—a power lawnmower

Sink it!

On the putting green



(L to r): W Pennock (Du Pont), C W Lever (Goodall Sanford), C M Kopatch (Ciba)

ABSTRACTS

Effect of Synthetic Fibers on the Market for Viscose Rayon

J B Goldberg, *Textile Recorder* 70, 95-6, May, 1952.

The author makes this prediction:

"Viscose is still the king of man-made fibers and it will take more than a mild revolution led by the new fibers to depose this ruler or cause any severe loss of the empire built up during the past forty years."

Dealing with the cost factor, he points out that existing modern plants for producing viscose cost much less than the completely integrated establishments now under construction for producing the newer fibers. Raw materials costs for the manufacture of viscose are appreciably lower than those for the synthetics. He believes that viscose is likely to hold this advantage for some time to come.

Admitting that many of the "miracle fibers" can yield a better dollar value in certain applications due to their greater length of life in service, higher strength-weight ratios, lowered maintenance expenditures and other cost-reducing elements, the author points out that remarkable improvement has been made in rayon manufacture in recent years, and that it has been demonstrated that the serviceability of today's rayon is adequate to meet the competition of the newer synthetics.

He stresses the "latitude of dyeability" of viscose in comparison with that of the newer fibers. While the resistance of rayon to mildew or bacteria and its flammability are generally inferior to those of the synthetics, the applicaion of materials to impart mildew and flame resistance to rayon can be readily accomplished.

For certain purposes viscose appears to be strongly entrenched, he said, and no great inroads on these markets by any of the newer synthetics can be anticipated. Among these are tire cord, garment linings, carpetings, and automobile interiors. On the other hand, a loss must be expected in lingerie fabrics and probably in curtains. The hosiery trade showed a tremendous reduction in rayon consumption from 1942 to 1949, but further losses will probably be small, he said.

The author points out that the resistance to abrasion of rayon woven or knitted materials can be greatly improved by the addition of comparatively small percentages of nylon, and that this will open the door for greater consumption of rayon, particularly in outerwear apparel. Similarly, blending of the acrylic fibers and Dacron with rayon is opening up new fields for the latter.

In conclusion, he suggests that as long as the new synthetics possess unusual dyeing properties, viscose can always be relied upon to be useful in combination to yield attractive cross-dyed effects.

Improving the Fastness of Cotton Dyeing

M R Fox, *Textile Recorder* 70, 94, May, 1952.

The demand for high fastness properties of colored cottons has increased tremendously during the last 20 or 30 years.

During a soda-boiling process, conditions are favorable for the reduction of many dyes, since cotton cellulose behaves as a reducing agent. It is desirable to select dyes which are difficult to reduce. Certain azoic combinations containing nitro groups are partially reduced during soda boiling, with the formation of amino groups, resulting in an alteration in shade and a tendency to bleed into white cotton. Likewise, easily reducible vat dyes are converted into their alkali-soluble leuco compounds. The author comments that m-nitrobenzene sulfonic acid, which is a mild oxidant, inhibits this reducing action of cellulose in alkaline media.

The severity of various oxidizing treatments on an anthraquinone-type vat blue has been studied. Hydrogen peroxide, percarbonates, perborates, etc, produced no greening; sodium hypochlorite gave appreciable evidence of azine formation by a marked greening; acid potassium bichromate gave slightly more greening than hypochlorite and could not readily be corrected by hydrosulfite treatment; nitric acid (10 per cent) gave a dull blue-green shade indicating that almost all of the di-hydroazine; and nitric acid (63 per cent) produced a pronounced yellow-green shade, indicating that almost all of the di-hydroazine had been converted into azine.

The author points out that the pH of dyed cotton goods, resulting from the after-treatment and finishing process used, may have a marked influence on the fastness to light. Some direct dyes, for example, show a decrease in fastness on either side of neutrality. Several sulfur dyes exposed under alkaline conditions fade appreciably more than under neutral conditions. Certain vat dyes fade more rapidly if the pH is between 9 and 10. The azoic dyes as a class are the least affected by pH conditions.

The author considers that the best way to improve the light fastness of direct dyes is by an aftertreatment with simple inorganic copper salts. This can only be successful when the dye has suitable chemical groups to co-ordinate with the copper ion. The commonest grouping, he states, is a hydroxyl group adjacent to an azo linkage.

Special Methods of Degumming Silk

W Müller, *Ciba Review* 91, April, 1952, p 3290-1.

The old practice of treating hanks in a neutral or slightly alkaline soap bath is still the customary method of degumming silk, and when carried out with sufficient care, causes no damage to the fiber. Light piece goods may also be "boiled-off" by this method. The degumming of heavier quality goods, and particularly closely woven material, is, however, attended with certain difficulties; e g, it is very difficult to completely degum the selvages. Also acetate rayon effect threads, if present, are partially saponified or delustered.

The following new methods of degumming silk have been proposed:

(1) *Degumming in an Alkaline Bath.* Treatment of silk and mixed fabrics of silk and viscose rayon in an alkaline bath would appear to be the obvious method of degumming, as sericin is readily soluble in alkalis. It is true that strong alkalis attack the fibroin also, but experience has shown that by judicious application and careful control of the baths they may be used without danger. The alkaline treatment can be carried out in a used soap bath which has been adjusted to pH 9.5 (maximum) with caustic soda. The treatment is interrupted before all the gum has been removed, and boiling-off is completed in a fresh, neutral soap bath. If acetate effect threads are present, this method cannot be used, of course.

(2) *Acid Pretreatment.* Treatment with hot mineral acids causes partial decomposition of the sericin which facilitates its subsequent removal in a neutral or weakly alkaline soap bath. The silk is treated at 140° F for a period of from one to several hours in a bath containing 2¼ pints of sulfuric acid 66° Bé per 100 gallons. The goods are then neutralized with soda or ammonia and degummed in a normal soap bath.

(3) *Papain Pretreatment.* By this method the sericin is decomposed without damage to the fibroin and subsequently removed in a neutral soap bath at a comparatively low

temperature. Papain is derived from the latex of *Carica Papaya* and is marketed either as a dry, crumbly mass or as a fine powder. It is used as a suspension in the presence of hydrosulfite powder and sodium thiosulfate, the following being a typical formula:

1½ lbs Papain
½ lb Hydrosulfite Conc Powder
½ lb Sodium Thiosulfate
per 100 gallons

The silk is entered into this bath at 140° F and worked for one or more hours. After a short rinse the goods are then boiled-off in a neutral soap bath at 175° F. This method is particularly suitable for degumming silk goods containing white or light-colored acetate effect threads.

Printing Acetate Rayon

D W Shaw, *Textile Mfr* 78, 37-8, January, 1952.

The author calls attention to certain acetate dyes which fade in the presence of oxides of nitrogen, and recommends that these be avoided wherever possible. If necessary, a suitable gas inhibitor, preferably one that has affinity for the acetate fiber, may be added to the printing paste.

At the present time the water-soluble acetate dyes are little used for printing. The dispersed types are preferred because of their greater ease of application and their lower sensitivity to steaming conditions. Where possible the dispersed dyes in paste form should be used in preference to the powders, on account of their finer state of dispersion.

The preparation of the printing paste is simple. The dye in paste form is diluted with water and strained into the thickening, to which a suitable assistant, such as glycerine, has been added.

In machine printing it is necessary to use a finer scale of engraving for printing acetate fabrics than is used for cotton materials of similar construction, so as to reduce the amount of paste transferred to the cloth. Special allowances must be made, in engraving the rolls, for the subsequent flushing or spreading out of the pattern.

The dispersed acetate dyes do not require the addition of solvents or swelling agents, if the prints are steamed for a long period (one hour or more at atmospheric pressure), in fairly moist steam. The use of a wetting agent is of assistance in printing hard cloths such as tightly woven taffetas. Pressure steaming is not advisable because of the adverse effect it may have on the tensile strength of the fabric.

In washing prints of dispersed dyes it is best to use only cold water, and to avoid the use of warm soap which may cause staining of the white portion of the cloth.

A number of the dispersed acetate dyes are dischargeable with reducing agents. At present the preferred discharging agents appear to be the sodium, neutral zinc, and barium formaldehyde sulfoxylates. Discharge printing of acetate fabrics, however, presents problems that have not been completely solved. In discharging dark shades it is often necessary to use swelling agents in order to penetrate the fiber sufficiently; the prints have a tendency to halo during steaming; and it is difficult to wash out the decomposition products of many dyes, which if not removed will later oxidize to colored compounds and spoil the appearance of the discharged portions.

Microscopy for the Dyer and Finisher

J C Brown, *Dyer 107*, 258-60, Feb 22, 1952.

The microscope has been used for many years for identifying fibers, and numerous methods have been developed for testing fiber damage and modification during processing in which the use of the microscope is essential.

The author explains the working of the modern compound microscope, and states that by its use it is possible to see objects as small as .0002 mm in diameter. For textile use, however, a microscope magnifying up to 500 times is adequate, and in practice, magnification of from 100 to 200 times is often sufficient.

Two recent trends have increased the number of microscope users in the textile industry: the advent of an increasing range of regenerated and synthetic fibers, and the increasing tendency to use reclaimed and waste fibers.

Before fibers are examined under the microscope they must be mounted on a slide in a suitable liquid, usually water. For most purposes it is sufficient to mount the fibers whole, and it is possible to recognize all textile fibers in this way without resorting to any other technique.

Cotton is characterized by twists along the fiber. When it is mercerized, however, the fiber swells and the twists disappear. The most obvious feature of the wool fiber is the outer scale structure. Practically all animal fibers have this characteristic, but variations in the structure offer a means of identifying the different types. Viscose is recognized by its longitudinal striations.

The cutting of cross-sections is a valuable aid to identification. Another useful technique is the use of polarized light; for example, linen fibers examined by polarized light appear brilliantly colored, and this is a positive method for distinguishing linen from mercerized cotton.

Pigmented fibers are best examined by mounting in a liquid of the same refractive index as the fiber, which thus becomes invisible, and the particles of pigment stand out clearly.

Damage to the cuticle of cotton fibers can be detected by cutting very short lengths of the fiber and examining them in a drop of 18 per cent caustic soda on a microscope slide. Damaged fibers swell much more than undamaged ones. Cotton fibers attacked by mildew are first stained with an alkaline solution of Congo Red. Wool fibers to be examined for damage may be stained with Kiton Red G or Victoria Blue B; the latter is useful in detecting over-chlorination in antishrink treatments.

Chemical Changes Occurring in Wool During Wet Processing

A J Farnworth, *Textile J Australia* 27, 223-7, April, 1952.

During the conversion of greasy wool into a finished fabric, the fibers are subjected to a wide variety of chemical and physical processes. These processes are generally of such a nature that in the absence of careful control, considerable degradation of fiber characteristics could result. Obviously it is desirable to preserve as many of the attractive properties of the fiber as possible, and the aim in wet processing should be to choose conditions where the desired changes are produced with a minimum modification of the fiber. There are exceptions where a chemical modification is essential for producing some property not possessed by the raw material, e g, antishrink, crabbing, blowing, etc. Even here, careful control must be exercised in order to avoid excessive damage to the wool.

Wool is a member of the protein family and is thus built up by the condensation of α-amino acids, i e, compounds of the general formula $R.CH.NH_2.COOH$, where R varies considerably from hydrogen to most complex groups. The author describes these amino acids in much detail, and shows how they are built up into long chain molecules, commonly known as peptide chains. The acid and basic side groups attached to the chains react with each other with the formation of cross-linkages, known as "salt linkages". Also, the molecule of cystine, the amino acid occurring most frequently, having an amino and carboxy group at each end, is able to undergo condensation and be incorporated in two adjacent peptide chains, whereby a very strong co-valent bond unites the chains. This linkage is known as a "cystine linkage" or "disulfide bond". Several other amino acids in wool are also quite reactive.

Before considering the chemical effect of wet processing, it is important to realize that the fiber has probably already been chemically modified during growth. It has been found that the tip portion of fibers is different from the root. Water in presence of air and sunlight can break down the cystine linkages in wool, with the result

that the tip of the fiber has greater swelling in aqueous media. Consequently it is usually more heavily dyed than the remainder of the fiber. Alternatively, with some dyes the tip dyes less heavily than the root.

During scouring, wool is subjected to the action of an aqueous solution of soap and sodium carbonate at pH 9-11 and temperatures of 40-50°C for periods of time varying from 5 to 10 minutes. Under these conditions several chemical changes may occur within the fiber:

(a) The salt linkage may be broken.
(b) The cystine linkage may be attacked.
(c) The peptide chains may be hydrolyzed.

Reaction (c) is believed to be the main cause of any loss of strength in scouring, but all of these reactions have been shown to occur by studying the effect of alkalis on wool under laboratory conditions.

Carbonizing. As in the case of alkali, the reaction of wool with sulfuric acid has been extensively studied under laboratory conditions, and several reactions have been observed to occur, including conversion of the free amino groups into sulfamic acids and sulfonation of aromatic nuclei. It would appear, however, that any degradation of the fiber during carbonization is again due to peptide chain hydrolysis.

The work described in this paper is concerned only with chemical modification of the fiber, and any physical effect resulting from it. No attempt has been made to measure the physical degradation due to mechanical effects such as squeezing between bowls. It seems quite probable that this type of degradation may be as great as that due to chemical action, if not greater.

The Resin Aftertreatment of Direct Cotton Dyes

G H Lister, *Textile Recorder* 69, #829, 85-6, #831, 89-90, April and June, 1952.

The direct cotton dyes are the easiest class of dye to apply to cellulose fibers, and in addition, many members of the range possess excellent fastness to light. Their deficiency, however, is their inability to withstand washing treatment in which bleach in the form of hypochlorite is used, and their marked inferiority to soap and synthetic detergents, compared with vat dyes.

Attempts have been made to improve the fastness to washing by aftertreatment with metallic salts and with formaldehyde, but there was still a wide gap between the fastness so obtained and that of vat dyes.

An aftertreatment with the cationic compound, cetyl pyridinium bromide, reduces the solubility in water by reaction with the sulfonic acid groups in the dyes, but the fastness to alkaline washing is little improved.

The use of a new type of cationic resin has much improved the prospect of obtaining washfastness equal to that of a vat dye. These new resins react with a limited range of direct dyes, giving dyeings which will withstand an alkaline soaping at 90° C.

Some dyes show a loss in lightfastness following this treatment. Much of this trouble can be overcome by the use of a copper salt with the resin, or the copper salt of the resin itself.

It is not always easy to obtain level aftertreatment by this new method, particularly in pressure dyeing machines. Experimental dyeings carried out in the laboratory using quantities of resin of less than 1 per cent on the weight of material invariably led to uneven results. Moreover, very varied results were obtained as far as increase in fastness was concerned. When, however, a minimum of 2 per cent resin was used irrespective of the depth of shade, results were always level and repeatable. The author suggests, therefore, that whenever circumstances justify it, a standing bath should be used containing not less than 2 per cent resin (calculated on the weight of material to be dyed), and that it should be brought back to the original strength after the passage of each batch and estimation of the quantity lost.

Shading with additional dyes to correct a wrong shade cannot be carried out when the material has been aftertreated unless the resin is first stripped from the goods. This may be done either by boiling the material with 3 to 4 per cent formic or phosphoric acid, or alternatively, with 3 to 4 per cent of caustic soda.

Dyeing of Dacron Polyester Fiber; Evaluation of Dyeing Assistants

Anon, *Du Pont Technical Bull* 8, 69-78, June, 1952.

Past experience has shown that the development of a new synthetic fiber was usually accompanied by problems pertaining to its coloration. Dacron has proved no exception, but many of the difficulties originally encountered have now been largely overcome.

Dyeing with a "carrier" promotes better color value, greater penetration, and also results in improved washing, crocking, and sublimation fastness. Almost a thousand "carriers" have been evaluated, the most satisfactory from a performance standpoint being benzoic and salicylic acids. One of the prime factors influencing the use of these carriers is their high cost, and the search continues for agents that will overcome this objection.

Early studies on the dyeing of Dacron showed that the incorporation of certain aromatic compounds in the dyebath greatly improved the affinity and exhaustion efficiency of dispersed dyes. While benzoic acid is considered the best all-round carrier, several other compounds are recommended, if used under proper conditions. These include the following:

Para-phenylphenol is very effective at low concentrations but adversely affects the light fastness of most colors.

Mono-chlorobenzene is used in about the same concentration as benzoic acid but has the advantage of being more economical. It should be used only where the ventilation is very good, since its vapors are toxic.

Ortho-phenylphenol is similar to para-phenylphenol in effect on the dyeing and has the advantage of being more available. It is preferably used as the sodium salt and regenerated with sulfuric acid during dyeing. Ortho-phenylphenol does not show the adverse effect on light fastness caused by para-phenylphenol.

Besides those already mentioned, the following types of compounds were evaluated:

Several alcohols, including diethyleneglycol and glycerine, were tested, but were found to have a retarding action on the dyeing.

The methyl esters of benzoic and other acids gave good results if the material was padded with the ester dispersion before dyeing.

Several naphthyl ethers were evaluated, but harshened the fabric and gave poor crockfastness.

Naphthalene and Tetralin were good carriers but tended to steam-distil.

Several other halogenated compounds in addition to mono-chlorobenzene were efficient carriers but the dyeings were unlevel and the baths had an obnoxious odor.

Several ureas and substituted ureas showed no effect as carriers.

A table is included which gives the optimum concentration and results obtained from testing these various compounds.

Carrier Dyeing of Dacron Polyester Fiber With Ortho-phenylphenol

Anon, *Du Pont Technical Bull* 8, 99-103, June, 1952.

This article supplements the one quoted in the previous abstract, and describes extensive tests made with sodium orthophenylphenate in the hope of utilizing it as a carrier for dyeing both 100 per cent Dacron and blends with other fibers.

In dyeing 100 per cent Dacron with the dispersed acetate dyes, a concentration of 2.0 to 3.5 g p l appears to be optimum. The addition of one-third as much sulfuric

acid as sodium salt to regenerate the free phenol gives a slight excess of acid. Dyeing is started cold, and is continued at the boil for two hours or longer. Scouring after dyeing is recommended to remove loose dye and carrier.

In dyeing unions of Dacron and wool, the Dacron is dyed with acetate dyes and the wool with Chromacyl dyes, with the addition of 3 g p l of the carrier. The sulfuric acid required to regenerate the phenol is added in portions, one-half to the cold bath at the start and the remainder after boiling for one hour. The goods should be thoroughly scoured after dyeing.

In dyeing unions of Dacron and rayon, it is recommended to start cold with direct and acetate dyes, salt and carrier (3 g p l). Dyeing is conducted for one-half hour at 180-190 F, one-half of the sulfuric acid is added, the bath is raised to the boil, and the rest of the acid is added after one-half hour. The goods are neutralized cold with soda ash and scoured with a suitable detergent.

The sodium salt of ortho-phenylphenol in both 5 and 1 per cent aqueous solutions causes skin irritation, but the author believes that no trouble should be encountered if reasonable precautions of cleanliness and care are taken.

Wool's Properties Make It Unique

W von Bergen, *Textile World* 102, 136-7, June, 1952.

The main properties of the wool fiber that are responsible for the position wool holds are its high absorptive properties, the high resilience of wool in its dry and wet state, the resistance to wicking of water, its ability to felt, its good dyeability, and its resistance to free flaming.

When dry wool is loaded beyond the yield point of 20 per cent extension, it does not fully recover, whereas the wet fiber, under the same conditions, is 100 per cent recoverable.

The excellent elastic-recovery properties, particularly at low load, make wool good in its resistance to wrinkling and creasing.

Wool is especially unique in its ability to keep a high amount of air entrapped because the air clings to the fibers, forming a wind-break. Wool fabrics feel warm to the touch because the heat transferred from the skin to the fabric is very low, and in addition, have good thermal conductivity. They are also outstanding in regard to moisture transfer, especially in the matter of body perspiration through the fabric, as the water vapor will pass not only through the fabric openings but also through the fibers themselves.

Wool has the ability to hold more water than any other fiber without feeling wet. It absorbs water vapor slowly and also releases water at a very low rate. The hydrophilic wool fiber thus acts as a damping mechanism in protecting the body from sudden environmental changes.

Wool is a nonthermoplastic fiber, which is of great advantage in terms of ironing and pressing. There is no danger of its melting or heat-shrinking.

Wool and its related animal fibers are the only ones that will felt. This property makes possible the manufacture of nonwoven felts and the host of outerwear woolens and worsteds. To make felting possible, a fiber must possess a surface scale structure, it must be easily stressed and deformed, and it must possess a power of recovery from deformation. Wool is unique in its ability to satisfy these three requirements.

Mildew Can Damage Cotton in 6 Hours, Even Though Not Seen by the Naked Eye

Anon, *Textile Inds* 116, 114-15, June, 1952.

Mill men and researchers are familiar with the damage that molds or mildews do to cotton fabric. What is not generally known is how these microscopic organisms break down cotton so rapidly.

Molds will grow whenever there is plenty of moisture and when they are in contact with organic materials. Just as plant seeds sprout under the influence of moisture and warmth, so do mold spores sprout under similar conditions. If this sprout comes in contact with organic material which it can digest, its enzymes will change this material in such a way that it will be able to pass through the cell walls of the mold as it grows.

Each cotton fiber is a combination of resistant and nonresistant cellulose. The nonresistant cellulose is called amorphous cellulose and is believed to be readily dissolved by the mold enzymes. However, there is more of the resistant or crystalline cellulose in each cotton fiber, so that the fabric appears to be undamaged until it is handled, whereupon it falls apart.

The localized nature of mold attack on cotton can be seen under the microscope when a fiber is bathed in weak sodium hydroxide. This chemical has no effect on undamaged fibers. However, if mold-damaged fibers are examined under the microscope during the first 24 hours of attack, and sodium hydroxide is added, the cotton is seen to dissolve away in one or two spots along the fiber. What has happened is that the mold has found these weak places and has begun the process of dissolving the cotton. The sodium hydroxide completes the process.

Within a matter of six hours cotton fibers can be damaged by molds to a considerable extent. There is sufficient moisture in most mills to cause mold spores to germinate and grow. Favorable conditions for mildew on cotton are a moisture content of over ten per cent, relatively high storage temperature (about 90° F) and poor ventilation. Under extreme conditions fibers can lose as much as 50 to 70 per cent strength in 72 hours.

Where products are present on the fiber which are more susceptible to mildew growth than cellulose (e g, glucose or starch), the molds will attack these products first and will attack the cellulose only after most of the other product has been destroyed. This is important to manufacturers in that if they notice mildew formation on cloth, and if the cloth is washed soon enough, the fabric can be saved.

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U S P 2,566,338 (Kime) 86 (1952)
U S P 2,566,075 (Bleachers Ass'n—Lockers) 85 (1952)
U S P 2,565,832 (Whitner) 826 (1951)
U S P 2,565,358 (see also U S P 2,518,266) (Imperial Chemical Industries) 826 (1951)
U S P 2,565,259 (American Cyanamid) 10 (1952)
U S P 2,563,394 (Cadgene) 10 (1952)
U S P 2,562,603 (Coe, Jr) 87 (1952)
U S P 2,562,558 (Scholtens Chem Fabr) 86 (1952)
U S P 2,562,457 (Morton Sundour Fabrics) 778 (1951)
U S P 2,562,161 (Cluett, Peabody & Co) 778 (1951)
U S P 2,559,809-10 (Imperial Chemical Industries) 825 (1951)
U S P 2,559,412 (Dungler) 777 (1951)
U S P 2,559,030 (Rottier) 748 (1951)
U S P 2,558,245 (Du Pont) 748 (1951)
U S P 2,557,185 (Celanese Corp of America) 747 (1951)
U S P 2,554,881 (Ciba Ltd) 747 (1951)
U S P 2,553,375 (Naphthol Chemie) 825 (1951)
U S P 2,553,243 (Durand & Huguenin) 716 (1951)
U S P 2,552,807 (Celanese Corp of America) 749 (1951)
U S P 2,556,241 (Du Pont) 777 (1951)
U S P 2,552,404 (Ciba Ltd) 715 (1951)
U S P 2,552,078 (General Dyestuff Corp) 716 (1951)
U S P 2,550,047 (Francolor) 715 (1951)
U S P 2,549,713 (Research Corp, New York) 749 (1951)
U S P 2,549,099 (Fabric Res Lab) see Brit P 652,899 ..... 539 (1951)
U S P 2,548,853 (American Viscose Corp) 715 (1951)
U S P 2,548,740 (Rugh) 605 (1951)
U S P 2,548,545 (Cyanamid) 605 (1951)
U S P 2,548,544 (American Cyanamid) 538 (1951)
U S P 2,547,220 (Dewey & Almy Chemical Co) 538 (1951)
U S P 2,545,450 (Pacific Mills) 537 (1951)
U S P 2,545,277 (Hannah, La Salle) 537 (1951)
U S P 2,544,892 (Du Pont) 490 (1951)
U S P 2,543,718 (Interchemical Corp) 478 (1951)
U S P 2,541,184 (Sun Chemical Corp) 477 (1951)
U S P 2,540,799 (General Aniline) 477 (1951)
U S P 2,539,704 (US Rubber Co) 748 (1951)
U S P 2,536,978 (American Cyanamid) 477 (1951)
U S P 2,518,266 (Imperial Chemical Industries) see U S P 2,565,358 ..... 826 (1951)
Can P 478,723 (General Aniline & Film Corp) 152 (1952)
Can P 469,312 (Bancroft) 478 (1951)
Brit P 664,079 (Imperial Chemical Industies) 306 (1952)
Brit P 663,769 (Monsanto Chemical Co) see U S P 2,533,635 (*Am Dyestuff Reptr* **40**) 280 (1951)
Brit P 663,066 (Standfast Dyers & Printers) 306 (1952)
Brit P 662,452 (Heberlein & Co) 275 (1952)
Brit P 662,181 (Van Vlissingen) 305 (1952)
Brit P 661,800 (Sandoz Limited) 305 (1952)
Brit P 661,376 (Dan River Mills) 152 (1952)
see U S P 2,486,399 (*Am Dyestuff Reptr* **39**) 99 (1950)
Brit P 660,261 (Striker) 152 (1952)
Brit P 659,667 (Stevenson Dyers Lim) 118 (1952)
Brit P 659,078 (Monsanto Chem Co) 118 (1952)
Brit P 658,353 (McCormick) 88 (1952)
Brit P 656,507 (General Aniline & Film Corp) 152 (1952)
Brit P 655,779 (Tootal-Broadhurst-Lee Co) 151 (1952)
Brit P 655,276 (Fisher and Wheatley) 11 (1952)
Brit P 653,455 (Fairlawn Finishing Co) 777 (1951)
Brit P 652,985 (Courtaulds Ltd) 747 (1951)
Brit P 652,899 (Fabric Research Labs) (also U S P 2,549,099) 539 (1951)
Brit P 652,449 (Courtney) 717 (1951)

NEWS

• Space All Sold For Chicago Chemical Show

All floor space originally plotted for the National Chemical Exposition in the Chicago Coliseum September 9 to 13 has been sold and efforts are being made to set up a few extra booths to take care of late applicants, it is learned.

The Exposition, seventh in a line of biennial shows, is expected to repeat its successes of former years, according to James J Doheny, manager.

The 1952 exhibit will present the same broad distribution of exhibitors as 1950 attracted, Mr Doheny reports, on the basis of space sold to date. About 52 per cent will be manufacturers of equipment, about 17 per cent apparatus supply houses, about 25 per cent chemical and the remainder composed of publishers, societies, consultants and others.

Nearly 250 exhibitors will be represented, it is reported, before an expected attendance in excess of 20,000. The Centennial of Engineering is being celebrated at the same time by a group of engineering societies and many of their guests have indicated interest in the Exposition, especially its chemical engineering phases.

• National Distillers Acquires Algonquin Chemical

National Distillers Products Corporation announced on July 18 that it is acquiring the business and assets of the Algonquin Chemical Company, manufacturers of chlorine, caustic soda and sulfuric acid, with plants located at Huntsville, Alabama; Dubuque, Iowa; and Lawrence, Kansas. The purchase is designed to insure a supply of these basic raw materials required by National in its expanding chemical activities. No change in the operation or personnel at the plants is contemplated as a result of the acquisition, it is reported.

National Distillers Products Corporation has also announced that arrangements are complete for the sale of their White Rock Division to a group of private investors who will continue the existing business of the White Rock Company. By this move National withdraws from the soft drink field and continues its expansion in the chemical industry.

• TCCA Elects

At the 37th annual business meeting of The Textile Color Card Association, held on July 10th at the organization's offices, 200 Madison Avenue, the following directors were reelected: JAMES DIEPHUIS — vice-president, Pacific Mills, W J FULLERTON—merchandising manager, Dan River Mills, Inc, HENRY A HAFNER—president, Hafner Associates, Inc, CHARLES F H JOHNSON, JR—president, Botany Mills, Inc, W RALPH MacINTYRE—president, Joseph Bancroft & Sons Co, ROBERT A RAMSDELL—executive, E I du Pont de Nemours & Co, Inc, ARMAND SCHWAB —president, Armand Schwab & Co, Inc, ROY E TILLES, SR—president, Gotham Hosiery Co, Inc, HENRY C VAN BREDERODE — vice-president, Celanese Corp of America, and JOHN F WARNER—executive, Cluett, Peabody & Co, Inc.

At a meeting of the Board of Directors, held immediately after the business session, all officers of the Association were reelected, as follows:

President: Roy E. Tilles, Sr
1st Vice-Pres: Armand Schwab
2nd Vice-Pres: John F Warner
Treasurer: Henry C Van Brederode
Secretary and Managing Director: Margaret Hayden Rorke

27 delegates representing the standards bodies of 11 nations met at Columbia University (June 13-16) to work out international methods of test for yarn. Armand Vanden Abeele, general director, Union Cotonniere, S A, Gand, Belgium (with coat) exchanges remarks with A W Bayes, research manager, Ashton Bros & Co, Ltd, Cheshire, England (profile) during a working session of ISO Textile subcommittee 5, Yarn Testing.

• TRI to Study New Tests for Cotton Fiber

The United States Department of Agriculture, through the Southern Regional Research Laboratory of the Bureau of Agricultural and Industrial Chemistry, has contracted with Textile Research Institute of Princeton, New Jersey, to study new tests for cotton fiber characteristics which may relate to processing behavior. The project, supported under provisions of the Research and Marketing Act, is scheduled for a period of two years, according to a joint announcement made by the Institute and the Southern Regional Research Laboratory.

The testing and research program at TRI will reportedly be carried out on a large number of standard and experimentally-grown cotton varieties made into yarns at the USDA Fiber and Spinning Laboratory of the Production and Marketing Administration at Clemson, South Carolina, and on several large master samples of cotton processed into yarns and fabrics on a pilot-plant, or semicommercial, scale. An important part of this program is the measurement of single-fiber properties and the comparison of these properties with the properties of cotton in bulk and in yarn constructions.

Although this research for the Department of Agriculture is to be a unit in itself, it will be integrated into the larger Textile Research Institute Cotton Research Project which is being supported by industrial members of the Institute, it is learned. The Institute has been engaged on this 5-year Cotton Project since last September. The avowed purpose of this research is to extend present knowledge on the relationship of fiber properties with processing behavior and end-product quality.

Dr Helmut Wakeham will be project leader in the contract work for the U S Department of Agriculture. The contract project leader for USDA will be Mason DuPré, Jr, Special Assistant to the Director, Southern Regional Research Laboratory.

○ ICS Adds 3 Instruction Texts on Textile Dyeing

Three new instruction texts on textile dyeing have been added to International Correspondence Schools courses in textile engineering, manufacturing, and finishing and dyeing, according to John C Villaume, acting dean of the Scranton, Pa, institution. The first two lesson texts were written by Girard R Adams, sales consultant of General Dyestuff Corporation, and the third by John P Ploubides, superintendent of dyeing and finishing.

The texts reportedly deal with dyeing of all types of fibers, including the latest techniques in handling synthetics, the dyeing of the new blended fabrics, and the latest continuous dyeing techniques. They are available both to individual students and to companies using the ICS Selective Plan.

• Laminex Appoints New Sales Agent

Process Associates, West Englewood, N J, have been appointed selling agent for the Laminex Corporation's line of Fiberglas-reinforced plastic resin trucks, tanks and tubs, which are used in the textile industry in finishing, yarn conditioning and dye handling.

Weighing about 30% less than steel, the Laminex units are molded with smooth surfaces and rounded corners in one piece by a method employing matched metal molds. Their volume and weight capacities reportedly range from 10 gallons and 75 pounds to 535 gallons and 3500 pounds.

Process Associates is headed by Joseph Isle Dobrow, formerly president of Paterson Tallow Company, Inc and Colonial Chemical Company, Inc. Offices will be maintained both in West Englewood and New York.

OBITUARY

W G Hamlen

WALTER G HAMLEN, assistant manager of the Philadelphia district office of Du Pont's Organic Chemicals Department, died on July 11 in the University of Pennsylvania Hospital, Philadelphia.

Born in New Bedford, Mass, in 1898, Mr Hamlen attended the New Bedford Textile School and started his career as a colorist in 1917 with Jennings and Co, Boston, Mass. He joined Du Pont in 1919 as a colorist at Jackson Laboratory, Deepwater Point, N J. In 1922, he was made a demonstrator and salesman operating out of Du Pont's Philadelphia office. In 1944, he was named assistant manager of the Philadelphia district office.

Mr Hamlen is survived by his wife, Mrs Ellen G Hamlen, a son, John R, a daughter, Sarah G, and a brother, Carlton L, of Swanton, Vt.

WARREN B MACK

PROF WARREN B MACK, head of the Department of Horticulture at the Pennsylvania State College since 1937, died on July 6 in the Urological Hospital, Philadelphia, where he had been a patient for two months. He was 56.

Surviving are his widow, Dr Pauline Beery Mack, internationally-known chemist who is dean of the College of Household Arts and Sciences, Texas State College for Women, and formerly director of Ellen H Richards Institute, Pennsylvania State College; his mother, Mrs Anna L Mack; a brother, Vergel; and a sister, Mrs Evelyn Mack Rose.

• LTI Research Foundation Completes First Year of Operation

The first year of operation of the Lowell Textile Institute Research Foundation in its designated capacity saw the project program about equally divided between testing products newly launched on the consumer market of those ready to be presented to the public, and the further development and improvement of material already in extensive use.

Constant tests for color loss, durability variation, and moisture resistance on the part of new blends of synthetic and natural fibers as they are used in clothing, drapes, floor coverings, shoe linings, and outer bodies for small aircraft are being conducted.

In the development field, the Foundation seeks to extend the uses of established fibers and fabrics by discovering hitherto unknown inherent properties.

The Foundation does not, however, confine its facilities to the textile phase of experimental operations. At the present time, it is conducting a series of observations concerned with the improvement of the cleansing qualities of detergents, studying the possibility of adding to the wear resistance of industrial leathers, and development of a new paper for use by cigarette manufacturers.

For the military services, the Foundation is developing blends of man-made and natural fibers for combat use where protection from extremes of heat and cold, moisture and abrasion resistance, as well as great durability and over-all toughness, is vital. The safety and damage factors involved in the use of military personnel and equipment parachutes is being studied closely. Friction of the shroud lines against the canopy of the parachute as it begins to open in mid-air and at high velocity, especially when strong lateral winds are encountered, is likely to burn a hole in the canopy fabric and thus dangerously accelerate the rate of descent. Lubricating agents built into the canopy fabric and impregnated in the shroud lines, as well as smoother braided surfaces on the exterior of the lines, will greatly diminish the risk potential in individual or mass parachute drops, Foundation officials believe.

Experiments are in process on cloth for use in smaller parachutes which will be released from jet propelled planes at extreme altitudes and at supersonic speeds. These will lower photographic equipment, electronic weather recording devices, and antipersonnel explosives. In these uses, the fabric of which the canopy is made must be of great strength and yet of sufficient porosity to allow air to escape through the canopy to give a cushioning effect in order to prevent the instruments or missiles from becoming damaged by a too sudden deceleration or from tearing completely away from the parachute.

Experimentation on shock cushions to prevent damage to vehicles, guns, and other heavy equipment dropped from cargo parachutes is also in process.

The testing of parachutes has assumed an important part of the Foundation's program and a wind tunnel is now being built for parachute fabric evaluation. An impact tester, the only one of its kind, has been developed for measuring the forces to which parachute drop kits would be subjected in combat use.

The records of the Lowell Textile Institute Research Foundation indicate that a large part of the first year's work was performed for industrial plants in the Massachusetts area, although a considerable amount was done for units throughout the other sections of the country.

President of the Foundation is Roland E Derby, Sr, chairman of the Derby Company, and president of Textile Aniline, Lawrence, Mass. Vice President is Barnett D Gordon, president, MKM Hosiery Mills, Manchester, N H; and the Secretary is Dr Charles J Scully, Boston College Graduate School.

• 13 New Celanese Fellowships

Extending its University Graduate Fellowship Program, Celanese Corporation of America has announced the establishment of thirteen new fellowships and two post-doctorate fellowships at twelve leading educational institutions for the 1952-1953 academic year. Seven of the grants are for advanced study in chemistry; three in chemical engineering, two each in mechanical engineering and physics, and one in plastics.

Wellesley College, one of the nation's leading colleges for women, received a Graduate Fellowship in Chemistry; the first institution of its kind to receive recognition by the company. Other grants in this subject are at Columbia University (Teachers College); Harvard University; Louisiana State University; and McGill University in Canada.

The two post-doctorate fellowships in chemistry are established at the University of Rochester.

The awards in chemical engineering went to Princeton University, the University of Michigan, and the University of Wisconsin. Stevens Institute received the two fellowships in mechanical engineering; Cornell University and University of Illinois the physics grants, and Princeton University, a plastics fellowship.

Earlier this year, Celanese Corporation of America established five textile fellowships at leading textile schools.

• 3rd Standardization Conference

The Third National Standardization Conference, sponsored by the American Standards Association, will be held in conjunction with the Centennial of Engineering in Chicago, September 8-9-10, 1952, at the Museum of Science and Industry. The three day series of meetings will emphasize the role of standards in the many technological advances during the past century.

The 34th Annual Meeting of the American Standards Association will be held at The Waldorf-Astoria, New York, November 19th, 1952. The Howard Coonley Medal and The Standards Medal will be presented at the Award Luncheon.

• First TEF Scholarships

The first recipients of the newly-established Textile Education Foundation Scholarships at the Georgia Institute of Technology have been selected, it was announced last month by Dr Phil B Narmore, executive dean. They are James Edward Haynes, Manchester, Ga; Homer Douglas Moody, Greensboro, Ga; and Thomas G Ellington Jr, Thomaston, Ga.

Each scholarship amounts to $1,000 per scholastic year for each of the four scholastic years provided the student remains eligible. All three will enter Georgia Tech in the fall of 1952.

• Cyanamid Fellowship Program

American Cyanamid Company's program of grants and fellowships to universities this year included seventeen graduate fellowship awards in chemistry and chemical engineering. The fellowships were awarded to graduate students in their final pre-doctoral year of study and carry a stipend of $1,500 plus full tuition and incidental laboratory fees. They also include $300 for unrestricted use by the Department of Chemistry or Chemical Engineering of the student's university.

Universities where students have been awarded fellowships by Cyanamid for the 1952-1953 academic year include:

Carnegie Institute of Technology, Columbia University, Duke University, Iowa State College, Massachusetts Institute of Technology, Princeton University, Purdue University, Stanford University, Ohio State University, Pennsylvania State College, Tulane University, University of Colorado, University of Illinois, University of Michigan, University of Minnesota, University of Washington, and University of Wisconsin.

• KSC Chemistry Grants

Six commercial grants to the chemistry department of Kansas State College totaling $27,660 were announced last month by R I Throckmorton, director of the K-State agricultural experiment station. Four of the six grants are renewals to continue studies previously started.

Increased support of the Dow Chemical Company to $16,500 will be used to hire four graduate research fellows and to meet operational expenses in connection with studies of halogenated compounds. Recommended to be research fellows under the grant are Ernest Ikenberry, Joseph Peterson, and Donald Wheeler, all graduate students working toward the PhD degree in chemistry at K-State, and Huey Pledger, Jr, now with the Mellon Institute.

• NETF Fund Raising Campaign

Chairmen of the divisions of this year's campaign organization to raise funds for New England Textile Foundation scholarships and other forms of textile college aid have been announced by Melville Weston, General Chairman. Mr Weston is president of Newmarket Manufacturing Company, Lowell, Mass. Goal of the current campaign is $100,000, in the form of contributions from textile manufacturing and finishing concerns, converters, and representative firms in allied fields.

NETF funds are allocated to scholarships, purchase of needed instructional equipment, and faculty aid at four New England Textile Colleges: Bradford Durfee Technical Institute, Fall River, Mass; Lowell Textile Institute, Lowell, Mass; New Bedford Textile Institute, New Bedford, Mass; and the Textile School of R I School of Design, Providence, R I. Presently the Foundation also supports a Fellowship for advanced study at M I T.

These textile colleges, according to the Foundation, accept students from all over the world, and Foundation scholarships are available to any American high school graduate.

Chairmanships announced by General Chairman Weston for the Foundation's 1952 fund-raising campaign include: *Maine Textile Division:* Luther Dana, president of Dana Warp Mills, Westbrook, Me; *New Hampshire Textile Division*: George K Ripley, president of Troy Blanket Mills, Troy, N H; *Vermont Textile Division*: William T Dewey, vice president of A G Dewey Co, Quechee, Vt; *Massachusetts Textile Division*: Thomas T Clark, president of Talbot Mills, North Billerica, Mass; *Rhode Island Textile Division;* Charles B Rockwell, president of The Allendale Co, Allendale, R I; *Connecticut Textile Division*: M Doft, president of Princeton Knitting Mills, Watertown, Conn.

Chairmen of associated industry divisions are: *Wool Merchants Division*: Harry J Blake, Blake & Co, Inc; *Cotton Merchants Division:* Edward G Lyon, Hazard Cotton Co; *Yarn Dealers Division*: Hubert N Graves, Franklin Process Co; *Dye & Chemical Mfrs Division*: Edwin H Arnold, president of Arnold, Hoffman & Co, Inc, Providence, R I; *Textile Equipment Mfrs Division*: Richmond Viall, Marshall & Williams Corp.

The campaign will not start officially until early Fall, according to Mr Weston. However, a considerable number of initial gifts have already been received, ranging in size from $500.00 to $10,000.00, it is reported.

• Texaco Star Reports on Petrochemical Industry

One of the oil industry's traditional goals—the recovery of the energy content of crude oil—has been expanded with the birth of the new petrochemicals industry, according to Dr Wayne E Kuhn, manager of the Technical and Research Division of The Texas Company, and head of Texaco's multi-million-dollar research program.

Writing in a recent issue of *The Texaco Star,* the company's official magazine, Dr Kuhn predicted that the vast stores of recovered organic chemicals, which are based on the hydrocarbons of crude oil, will create new standards of living and add to the national security through more efficient use of natural resources.

In the same issue, in an article titled, "Young Company with a Big Future", the story of Texaco's petrochemical affiliate, Jefferson Chemical Company, is told. Written by Jefferson's president, P M Dinkins, the article outlines the rapid growth of the company and the variety of its products.

Of Jefferson's growth, he states, "While the plans were still on the drawing boards, the plant was doubled in size. . . . In 1950, a further 50% enlargement was completed. At present, yet another expansion . . . is being engineered."

Mr Dinkins reports that recent demand for ethylene oxide has been so large that Jefferson's sales of the material have been greater than those of the entire industry in 1948, when the company began operations.

The magazine also presents a two-page graphic chart of "Oil's Expanding Universe", showing the impact of petrochemicals on everyday life. A further highlight of the issue is a review of "Synthetic Liquid Fuels Production Costs", by W S S Rodgers, Chairman of the Board of The Texas Company, and chairman of the National Petroleum Council's Committee on Synthesis Costs.

• Restricted Russian Chemical Journal Available in English Translation

The Journal of Applied Chemistry of the USSR, one of a number of scientific journals no longer available from the USSR on a subscription basis, continues to be available in English translation in 1952, from Consultants Bureau, 152 West 42nd Street, New York 18, N Y.

Consultants Bureau publishes a complete English translation of the *Journal of Applied Chemistry of the USSR* at $80.00 per year, and complete translation of the *Journal of General Chemistry of the USSR* at $95.00 per year.

A cross index to the English translation of the *Journal of General Chemistry of the USSR* (Vol 20, 1950) may be purchased separately for $5.00.

The cross index contains four sections: 1) titles of papers, listed in sequence of appearance in the journal; 2) author index, arranged alphabetically; 3) subject index, arranged alphabetically; and 4) index to organic compounds, arranged according to empirical formula. The latter classification contains more than 1,600 entries.

Reference to the pagination of the English translation is given throughout the cross index. The original Russian pagination is also provided in the section listing titles of the 349 papers which appear in the 1950 volume. Any individual paper listed in the index may be secured in complete English translation from the publisher for $5.00.

A similar cross index is published with each volume of the two Russian chemical journals.

• ASTM Changes 1953 Annual Meeting Date

The American Society for Testing Materials has changed the date of its Annual Meeting for 1953 from June 22-26 to June 29-July 3. As already announced, the meeting will be held at Chalfonte-Haddon Hall, Atlantic City, N J. This change has been made at the request of the Departments of Commerce and State of the Federal Government and specifically of the United States National Commission of the Pan American Railway Congress Association.

• 27th Annual DCAT Dinner

Charles M Macauley, chairman of the Drug, Chemical and Allied Trades Section, New York Board of Trade, Inc (DCAT), has announced that March 5, 1953, would be the date of the 27th Annual DCAT Dinner. This, as usual, will be held at the Waldorf-Astoria, New York.

NEW PRODUCTS AND DEVELOPMENTS

• Nuodex PMO 10

Nuodex PMO 10, a new phenyl mercury oleate fungicide solution with 10% mercury as metal, is now being marketed by Nuodex Products Co, Inc of Elizabeth, N J. Said to be completely soluble in mineral spirits, this fungicide reportedly meets a number of government specifications, including the following:

MIL-P-906A—Preservative, wood, water repellent

USA-3-186—Sealer, wood preservative

USA-3-202—Stain, wood, olive drab

USA-4-1131A—Compound, textile preservative for field treatment

T-2278—Mildew-proofing of cork products

Samples are available.

• Success of CMC Continues

Hercules CMC or cellulose gum, which has been used as a thickener for textile printing pastes for several years, continues to enjoy important success, according to Hercules Powder Company officials.

Technically, CMC is purified sodium carboxymethylcellulose, manufactured under rigid specifications to give a product of excellent uniformity which dissolves readily in water to give economical, easily controlled printing pastes.

As a print paste thickener, cellulose gum is said to possess the following advantages: (a) since it dissolves in either hot or cold water, it washes out readily in hot or cold water giving soft prints; (b) no water softeners are needed; (c) sharp prints are possible, because the viscosities are uniform, free of contaminants, and smoothly-flowing; (d) several CMC types are available, permitting its use with a wide range of colors.

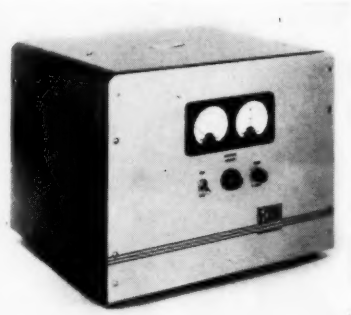
Printing pastes are said to be easily prepared by adding the dry cellulose gum to hot or cold water which is being stirred by a high-speed mixing device. The rate of solution will depend not only on the type of agitation, but also on the concentration of the CMC, it is stated; for even the highest concentrations used for print pastes, the CMC should be in solutions within 20 to 30 minutes if the stirring is rapid enough, according to Hercules.

	Typical Formulation		
	High-Vis Type	*Med-Vis Type*	*Low-Vis Type*
Percentage	2¼-3	3-3¾	9
Ounces/gal	3-4	4-5	12
Pounds/bbl	9½-12½	12½-15½	37½

Although CMC solutions are reported to be unusually resistant to mold and bacterial action, the Company advises the use of conventional preservative in solutions that are not used soon after being made up.

Like other print paste thickeners, CMC is not useful with every class of colors. However, it is pointed out that various types of CMC function well with most colors, and certain types of CMC are even preferred over other types in various formulations.

Except for a few colors cellulose gum is not generally satisfactory with basic colors, mordant colors, and such types as Palatine fast colors, according to the manufacturer.



Beckman Battery Power Regulator

• Beckman Battery Power Regulator

Beckman Instruments, Inc, South Pasadena, Calif, has announced a new Battery Power Regulator designed to give sustained accuracy and minimum battery maintenance when making measurements with Beckman Model DU Spectrophotometers. This new accessory reportedly permits the operator to exercise precise control in regulating the charging unit so that the battery can be supplied with the exact amount of current needed for operating the instrument. Thus, the battery is maintained at optimum charge in making DU Spectrophotometric measurements, needle drift resulting from power fluctuations is virtually eliminated, and the Spectrophotometer may be operated indefinitely without battery drain, it is claimed.

A unique feature of this new Regulator is that it enables the operator to make an accurate determination of the total current being consumed by both the Spectrophotometer and the tungsten lamp. It is contained in a compact metal case that also provides space for all of the dry-cell batteries usually placed in the bottom of the DU monochromater. Complete details can be obtained by requesting Bulletin 153-284 from Beckman Instruments, Inc, South Pasadena, California.

• Apparatus for Evaluating the Warmth of Textiles

An apparatus for measuring the warmth properties of cotton and of other textile fabrics promises to be useful in commercial application as well as in research to improve the utilization of cotton, according to the U S Department of Agriculture.

Dr G E Hilbert, chief of the Bureau of Agricultural and Industrial Chemistry which developed the apparatus, said the equipment was designed and assembled at the Southern Regional Research Laboratory in New Orleans to fill a specific need of its Textile Testing Section in evaluating the warmth of experimental cotton fabrics, but that certain features of the new development have attracted the attention of other laboratories and of industry as well.

With most test methods the warmth value of a fabric is rated by determining the difference in energy required to maintain a warm body at constant temperature in cold air when uncovered and when covered with test material. The apparatus developed at the SRRL reportedly applies this same principle, but instead of testing in still air the fabrics are subjected to a simulated wind along with low temperatures.

A metal "arm" clothed in a sleeve of the test fabric is lowered into a commercially-made home freezer in which a fan has been installed to maintain a wind velocity of 12 to 13 miles an hour over the surface of the fabric. This combination of wind with cold temperatures, which can be adjusted as desired, issaid to provide a better means of evaluating fabrics under conditions similar to those prevailing in Arctic regions and other cold climates.

Outlets for cotton in both military and civilian uses may be greatly increased by improving cotton's warmth-retention properties, and the new apparatus for evaluating these properties is a step in this direction, according to Dr Hilbert. He explained that some cotton products, before they are laundered, give the same degree of warmth as wool products of the same thickness and weight; but when cotton materials are washed the fibers often lose their fluffiness and mat together, thus cutting down on the number of air spaces and their effectiveness in retaining heat. If cotton can be made to retain all or even a large percentage of its original physical properties and warmth value after repeated laundering and long use, it will find new outlets as well as increased acceptance in a number of products, he predicts.

• Dextrol Silk Oils #42 and #84

Two new silk soaking oils are now being marketed by Dexter Chemical Corporation, New York.

Dextrol Silk Oil #42, designed to soften the gum of China and Japan silk in preparation for winding and throwing, forms an emulsion, which exhausts on the silk, according to the Company. It is used in standard silk soaking equipment.

Dextrol Silk Oil #84 is said to be particularly satisfactory for Duoppioni silk and has excellent stability. Active ingredients reportedly exceed 85 per cent.

• Hartamine

Hart Products Corp, 1440 Broadway, New York, N Y, have announced the development of Hartamine, an assistant for printing and dyeing aniline black.

It is claimed that the addition of 10 to 15% of Hartamine to the regular aniline black formulas prevents aniline blacks from turning green, maintains the tensile strength of the fibers, reduces the steaming time, improves the stability of the padding liquors and printing pastes, and eliminates aniline oil odor in the finished goods.

Hartamine is a concentrated dark colored liquid product. Samples, data sheets and application formulas are available upon request.

NAMES IN THE NEWS

Alfred Marzocchi

DR ALFRED MARZOCCHI has been appointed manager of the Textile Chemistry Section of the Owens-Corning Fiberglas Textile Products Laboratory at Ashton, R I. An expert in organo-silicon chemistry, Dr Marzocchi will direct laboratory efforts to develop new sizes for Fiberglas yarns and fabrics directed at further applications in additional industries.

Most recently manager of Organic Sales with Cowles Chemistry Company, Dr Marzocchi was previously engaged in research and technical sales with that company. He also worked previously as a quality control supervisor at the Ashton and Huntingdon, Pa, plants of the Fiberglas Corporation.

Dr Marzocchi had done considerable work on improved finishes and he is said to have played an important role in the development of Finish 136, a compound for increasing the wet strength of Fiberglas-polyester resin laminates.

HOOKER ELECTROCHEMICAL COMPANY has promoted HARVEY R ENGLE to works chemist of the Works Laboratory, a position formerly held by BURR H RITTER, recently retired.

Dr Engle came to the Hooker Company and the Works Laboratory as an assistant in 1939.

E J Black

ERNEST NATHAN, president of the Warwick Chemical Company, Division of Sun Chemical Corporation, has announced the appointment of E J BLACK, as sales manager of the Industrial Surfactant Department.

Prior to joining Warwick, Mr Black was associated with the General Aniline and Film Corporation in their Central Research Laboratories, and Antara Sales Department.

R K Goodhue

STAUFFER CHEMICAL COMPANY recently announced the appointment of R K GOODHUE as their Akron District Sales Manager. Mr Goodhue, who has been associated with Stauffer since 1942, will make his home in Akron.

J D McPherson

THE appointment of J D McPHERSON as sales supervisor of the Organic Acids and Plasticizers Department was announced on July 18th by American Cyanamid Company's Industrial Chemicals Division. He was formerly assistant to the director of purchases in the General Purchasing Department.

Mr McPherson began work for Cyanamid's Engineering Department in 1945. Prior to that time he was pilot plant superintendent for the G & A Laboratories, Inc, Savannah, Georgia.

DR JOHN B MILES, former member of the scientific team that developed the first atomic bomb, was named textile development engineer for the Research and Development Department of The Chemstrand Corporation on July 17th.

Dr Frank J Soday, research director, in making the announcement, stated that in his new assignment, Dr Miles would be in charge of projects dealing with development and use of Acrilan acrylic fiber, Chemstrand nylon, and other new fibers.

Dr Miles was assistant secretary and technical director for Delaware Research and Development Corporation, New Castle, Delaware, and before that he served for 21 years in key positions in research and development of nylon for E I du Pont de Nemours & Company, Inc. He is presently engaged in development of Acrilan acrylic textile fiber at Chemstrand's pilot plant at Marcus Hook, Pennsylvania.

HAROLD A SWEET has been appointed director of the Industrial Division, Refined Products Corporation, Lyndhurst, N J.

Before joining Refined Products Corporation, Mr Sweet was in the Sales and Sales Development Department of General Dyestuff Corporation, a division of General Aniline and Film Corporation, where he was active in the initial sales development of synthetic detergents, wetting agents and emulsifiers. Before this, Mr Sweet was for several years a department head in the manufacturing division of General Aniline Works Division of General Aniline and Film Corporation.

SYNTHRON, INC, Ashton, R I, has appointed WILLIAM R BATTERSBY technical representative in New England. Mr Battersby covered New England in technical sales for the Textile Chemical Department of Monsanto Chemical Company.

George Linberg, vice president in charge of New England sales, has stated that Mr Battersby would offer technical sales service to Synthron's New England clients.

RICHARD H SHAFFNER has been named sales engineer for Prufcoat Laboratories, Inc, Cambridge, Mass, manufacturers of vinyl and other synthetic-resin protective coatings. He had been employed for the past ten years as an operating supervisor and in the Engineering Department of the Hooker Electrochemical Company.

H B McCLURE, vice-president of Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation, has announced the appointments of JOHN CONWAY, J A FIELD and W A WOODCOCK as assistant managers to DR R L BATEMAN, manager of the company's Fine Chemicals Division. Mr Conway was formerly product manager in charge of nitrogen, chlorine, and sulfur compounds; Mr Field was product manager for intermediates, and Mr Woodcock, product manager for plasticizers, solvents and resin stabilizers.

The recent announcement of Carbide's new Coal-Hydrogenation Plant accentuates the demands to be placed on this Division, whose job it is to advance new materials from sample distribution to tank car sales, Mr McClure explained. These new appointments are said to represent a delegation of responsibility for sales development work caused by the large increase in new materials during the past few years, and in view of the expected increase in the future.

R Holthouser

H R Broome

NOVA CHEMICAL CORPORATION, New York, has added ROBERT HOLTHOUSER and HUBERT RAY BROOME to their sales force.

Mr Holthouser will work with A MOODY BURT in Virginia, North Carolina and parts of South Carolina.

Mr Broome will work with J LINDSAY WYMAN in South Carolina, Georgia, Alabama and Tennessee.

DR JOHAN BJORKSTEN, president of Bjorksten Research Laboratories, announced recently that his firm has established an office in Washington, D C, principally as a center for literature research in the libraries of the Patent Office, the Library of Congress, and other Washington depositories.

The office is under the direction of JAMES W PERRY, director of literature research of the Bjorksten Research Laboratories. HENRY C TOVEY is attached to the Washington office as literature chemist.

Mr Perry is a past chairman of the American Chemical Society's Division of Literature Chemistry, and is now serving on various American Chemical Society Committees. He is the author of several books, among which is a recent book on punch cards and mechanical aids in chemical literature searching.

FRANCIS J CURTIS, vice president and director of the Monsanto Chemical Company, St Louis, was elected president of the Society of Chemical Industry at its General Meeting in Aberdeen, Scotland, recently.

The Society of Chemical Industry, founded in 1881 in England, is an international organization of industrial chemists. Its American Section, formed in 1894, was reputedly the first chemical society in the United States to bring together those interested in industrial chemistry.

Other sections include several in England as well as others in Canada, Scotland, Northern Ireland and Australia.

Mr Curtis is the seventh president elected from the American Section by the parent society. His American predecessors in the office were: Professor Charles F Chandler, Dr William H Nichols, Professor Ira Remsen, Professor Marston T Bogert, Dr Arthur D Little and Dr Wallace P Cohoe.

Mr Curtis lately ended a year's leave of absence from the Monsanto Chemical Company during which he served as assistant administrator in the office of the National Production Authority in Washington, D C, in charge of its Chemical, Rubber and Forest Products Bureau.

STERLING ADVERTISING AGENCY, INC, New York, has announced the appointment of CAROL SCHREIBER as assistant account executive for its newly-created Industrial Division.

Miss Schreiber, a chemical engineer, has been acting in a similar capacity at the House of J Hayden Twiss for the past year. Prior to that Miss Schreiber was with the Antara Chemicals Division of General Dyestuff Corporation as assistant to the advertising manager.

DR RALPH BALL, who for the greater part of his 21 years' service with Celanese Corporation of America has been engaged in plastics research and development work, was named technical director of the plastics division of the company on July 10th.

In 1931, Dr Ball joined the development and research department of Celluloid Corporation, then an affiliate of Celanese Corporation of America, and subsequently served in various capacities. In 1948, after becoming assistant director of the Summit, New Jersey, research center, he was assigned by the company as co-ordinator of the Columbia Cellulose Company dissolving pulp project at Prince Rupert, B C. During World War II, Dr Ball served with the Organics, Plastics and Resins Section of the Chemical Division of the War Production Board.

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